THE CONTEXTS OF USE AND THE INNOVATION OF TV-CENTRIC NETWORK TECHNOLOGIES

AS VIEWERS BECOME CONSUMER-USERS

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DECLARATION

THIS THESIS IS MY OWN WORK AND NO PART OF IT HAS BEEN SUBMITTED FOR A DEGREE AT THIS, OR ANY OTHER, UNIVERSITY.

ACKNOWLEDGEMENTS

This thesis is dedicated to:

JACKSON POLLOCK (1912-1956) - ARTIST

"Technic is the result of a need - new needs demand new technics - total control - denial of the accident states of order - organic intensity - energy and motion made visible memories arrested in space - human needs and motives – acceptance."

JOHN BERGER (1926-PRESENT) - INTEPRETER OF ART

"The human imagination. . . has great difficulty in living strictly within the confines of a materialist practice or philosophy. It dreams, like a dog in its basket, of hares in the open"

More immediately, Acorn plc, DBB BMP Needham, NOP Market Research, members of the working group on user research, and of course the Cambridge Trialists, all of whom contributed to, and made possible this thesis. To them may I add my academic supervisors - Dr. Hamish Macleod and Prof. James Fleck. I am also in debt to Prof. Alfonso Molina who has provided valuable insights and inspirations, and to all those who have, and will, study to fuse technology, craft and the human potential. Last, but most certainly not least, family – Ae, Jane, William – reference points.

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Abstract

This thesis seeks to explore something of the current nature of human, social and business contingencies constituting and motivating design, production, consumption and the ***use*** of technologies. It places a particular emphasis on the innovation of ***TV-centric network technologies*** - 'new' media technologies, particularly interactive television (i-Tv), intended to link, enhance or otherwise augment existing television technology and content. The empirical work in the thesis studied the development and implementation of a complex large-scale i-Tv trial in Cambridge, UK. Issues arising from the research led to the development of a general research framework - ***Contextual Usability (CU)*** - whose central aim is to draw awareness to the complex and multiple dimensions of the use process as a social and organisational construction, and also to redefine its place as an intrinsic experiential dimension in the ***domestication*** of products and services.

Various senior managers and designers were interviewed within the company designing and producing the i-Tv technology and interface for the trial, as were 11 participant households. The author concludes with an overview suggesting the interconnected and interdependent nature of trials, technology, users, design, designers and organisation. For this he uses CU in relation to Molina's notion of ***Sociotechnical Constituencies*** to illustrate how social, cultural and organisational elements of trials both rely and impinge upon the implementation and interpretation of user and consumer research, and thus working 'images' of the user and the use process.

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PART ONE
CONCEPTUAL AND THEMATIC ISSUES

Chapter 1 – Interaction and technology

"Contempt of ancient learning is a sure sign of an enlightened mind. We are the men. Before our time, reason but little influenced mankind. The demonstration of the above assertion being that in times gone by there were no railways, steamboats, torpedoes, or any of the anaesthetic inventions in regard to time and space on which we pride ourselves, and upon which we claim to have advanced the general welfare of mankind. Marvels of science, mechanical improvements, increase of wealth (and income tax), and the perfection of all warlike apparatus, seem to blind us to the fact that abstract qualities of mind have shown no symptoms of progression . . . From the beginning there have always been Röntgen Rays, the principles of microphone and phonograph are coeval with the world. The wonder lies not in the discovery (so-called), but in the fact that they remained so long unknown. The real mystery is the mind of man." (Cunninghame-Graham, in Stirling, 1987: pp.xv-xvi)

"We are no longer just the passive viewer we are in control . . . So I think"

Trialist (case study 9)

Thesis and chapter introduction

The digital, knowledge, or information 'age' coexists and rests upon the products of its predecessors - the agrarian and industrial 'ages'. These previous 'ages' are sustained through the basic human necessity for food, clothing and shelter and the need for a constant stream of inexpensive, affordable produce and products. But these needs came to coexist with new needs such as those for electronically mediated entertainment and information. Similarly, the *purposeful* acts of 'going' to the cinema or 'listening' to the radio were never superseded by the advent of television 'viewing'. Neither were they superseded by the advent of video, nor video games, nor Internet-enabled PCs.

On the face of things there often appears a considerable chasm between the evolution of 'harder' systems of technical products and potentials, and the 'softer' systems of human societies and individual interests. But concurrently or through their *interaction*, they evolve and come to take on new defining qualities and characteristics. Humans enliven economic and technical networks of interconnected objects and meanings. Some functions or modes of thought persevere, whilst others fall into *disuse* and come to pass away. While there has always been a close, reflexive relation between technology and the human condition, do new technologies *open* new behavioural possibilities, new interests? Can they *close* them? Can they truly *create* them? What is the reach of the transforming power of either society, or technology, in what is essentially a co-shaping process? These are some of the core questions raised in this study.

Broadcasting, mass advertising, production, and distribution appear as critical in the 'age' of 'personalisation' and 'customisation' as they ever were before the advent and growth of digital networks or 'e-' or 'm-' commerce. But the means by which people may come to know, apprehend, access and pay for goods and services *is* changing. One would have difficulty shielding oneself from the abundance of discourse perpetuated regarding the 'potentials' of the Internet, as nearly every day, we are told

from some source or another how it will change every aspect of how we work, how we play. Even reputable sources such as Peter Drucker recognise its potential to:

> " . . . profoundly changing economies, markets, and industry structures; products and services and their flow; consumer segmentation, consumer values, and consumer behaviour; jobs and labour markets. Its impact is said to be even greater on societies and politics and, above all, on the way we see the world and ourselves in it." (Drucker, 1999: p.47)

This thesis documents technical, social, and organisational issues arising from a particular attempt to augment the functioning of television, a prospect which at the time was also viewed to imply radical change, not only to technology, but also to the nature of everyday commercial and domestic practice. In 1993, a British high-technology firm, Acorn Computers Group plc, based in Cambridge, UK, with a substantial pedigree in advanced computer design, were made a proposition: Could they create the future of domestic media in the shape of a networked interactive television (i-Tv) service? Their response manifested in the development of particular technical and service solution which I will refer to in this thesis as the 'Cambridge system'.

In order to raise necessary venture funding for the project they were required to *trial* their technology – to test its prowess to deliver a range of digitised content and services. Their technology was a digital 'set top box' (STB) - basically a computer optimised to use the television receiver as a screen, and which uses a remote control as an input device, and connects to a communications network via some sort of modem or network card.

But a STB is only a single, but nevertheless key, component of an overall *i-Tv system*. Building an operational system required [social] alliances with partners who would provide these other necessary [technological] components, including a communications infrastructure and content material. Only in concert would a communications system capable of delivering services such as video-on-demand (VoD), as well as other kinds of content and screens, be made possible.

The *Cambridge Interactive Television Trial* (CITV), which will be referred to as simply the 'Cambridge trial' was launched by ***Acorn On-Line Media*** (Om) an operating division of Acorn Computers, working in collaboration with a series of technology and content partners. The object of this trial was not purely to explore the technical provision of interactive entertainment, but to explore new services, commercial practices, organisation and consumer responses over several distinct trial phases. Each phase would witness iterative improvements to the technology and services, aiming towards the launch of a full commercial deployment. This was considered as the prototype for systems to be deployed in other cable networks worldwide.

In a purely *technical sense* each phase would represent increase in the stability and robustness of the system. In a *media content* sense, each phase would also witness the development of a more comprehensive range of consumer-attractive services and features. This would drive growth in an *organisational sense* with the trial involving more content and service partners providing additional content, services and technology. Each phase would also mark out the trial's development in a *social sense* through the involvement of ever more heterogeneous groups of trialists – users of the prototype system. In phase one the trialists would consist largely of interface and STB designers themselves. By phase three, with the technology robust and delivering an attractive variety of content and services – trialists would include members of the general public.

The trial officially began on the 30th Septemeber1994, drawing to an end in April 1997. As such it ran concurrently over the prescribed period of the Ph.D. study.

The structure of this thesis

This thesis divides into two main sections. The first four chapters offer a discussion of the literature from a wide range of fields that informed the thinking in this study. This literature, as well as tackling and coping with issues as they arose conducting the study led to the development of *contextual usability* (CU) - a framework intended

to place 'usability' in context with other elements contributing to an overall (whole) experience of a design product or service. This was in response to epistemological and methodological problems that were identified regarding 'usability' within the context of domestic media opposed to workplace computing. This comprises the frameworks, ideas and theories addressing the rich interplay and interaction between people and the technologies they create and use. The second section focuses more specifically upon the case of Acorn and the Cambridge trial.

The first section opens with the present chapter and my purpose here is to spend some time considering the ubiquitous nature of 'interaction' considered as a category within itself. From a human perspective, interaction is inseparable from experience and the cybernetic notion of feedback loops. Interaction either shapes experience, as in the *development* of knowledge or expertise, or creates and enables it, as in the *outcomes* of social or technical interaction. This can entail a range of implications, technical, business, learning, behavioural to name but a few. Actions and interactions can involve presuppositions about the environment in which those actions and interactions take place, and to a large extent this is certainly the case with interactive media. Interactions often occur within a designed and bounded environment of possibilities that can also shape and constrain possibilities, and thus any emergent properties and expertise. The nature of interactive design is such that some opportunities are opened whilst some are closed, and anticipation of opportunities must be an inherent part of the representational aspects which these systems contain.

This chapter considers interaction with respect to generating knowledge, as well as its influence in processes of innovation. With this in mind I focus particularly upon the *interaction* of new ideas and innovations which must then 'interact' with existing regimes, constraints and enablers of innovative activity. I then place interaction more within the technological context of the Cambridge system, and consider the problematic nature of interactivity as a defining quality of new media systems such as i-Tv.

In the following chapter, Chapter 2, the theme of interaction is taken forward by considering emerging frameworks which aim to map technical and social elements as they combine to give rise to products. These frameworks owe much to general systems theory (GST), and related areas such as cybernetics and complexity for their development. These are also areas which featured in the present study as they influenced the thinking of one of the senior mangers at Om as he tackled the problems of organisational learning and learning from the user during the trial. Mapping the interaction and interrelation of technical and social elements is especially relevant in the case of the development of communications systems as a user's interaction with a system inevitably entails explicit or implicit interactions with elements, actors, networks, constituents and constituencies beyond the interface, or the technical and human resources of any one firm. After presenting an outline of GST and related concepts, I outline two recent frameworks – *actor-network theory* (ANT) and *sociotechnical constituencies*. Both of these frameworks aim to map out the unique gestalt of influences, capabilities and perceptions that culminate to particularise technical products and systems, as well as the organisations which come to support and maintain their development and use. I close this chapter by discussing their relative merits and shortcomings relevant to the present study.

Chapter 3 shifts focus to the individual level, and considers how design products themselves come to be *apprehended* through *interaction with* concrete and symbolic attributes. This chapter introduces CU as a framework which aims to place the situations and circumstances of 'use', and the construction and experience of 'usability', in context with other social and experiential elements contributing to an overall (whole) experience of a design product or service. These obviously extend 'in front' of the interface or screen, as they focus more upon the user's background, interests, predisposition and social circumstances.

Chapter 4 offers a discussion of methods that can be used to bridge the gap between designers and producers and consumers and users. It details recent trends towards interpretative, naturalistic, ethnographic styles of inquiry (such as used in this study).

It also considers the new potentials for user research through registering changes within digital networks initiated by use and users (system-logging or 'sys-log').

In the second section focussing upon the case itself, Chapters 5 and 6 adopt a more typical historical case study style of reporting. They outline, first, the development of Om out of Acorn Computers Ltd. (Chapter 5) and, secondly, the more specific organisational, technical and social development of the Cambridge trial and system (Chapter 6). Chapter 7 explores what I term the 'process' of the research and details, in the manner of a 'reflexive ethnography' a more chronological set of interactions I had with managers, designers and trialists that featured in the trial. It highlights some of the tensions as well as the difficulties experienced personally with the research process, and of the organisational and knowledge generating problems involved in developing a concerted approach to conducting a meaningful user research programme.

Chapter 8 concludes the thesis by drawing together the various themes and propositions covered in the theoretical and case chapters. Contextual Usability is itself placed in context with sociotechnical constituencies and the subsequent fusion of frameworks is suggested as a means by which analysis of the experiential quality of products can be related to the wider spectrum of influences which culminate in product's development and use.

The value and scope of this study

The value of this study lies in its ability to depict the forces that shape and constrain innovation and design, particularly in a highly charged, visionary, volatile, dynamic new media industry sector. This sector is only just fully forming, and the methods used to study its various aspects have themselves been subject to some considerable revision and innovation. This study provides insight into key issues arising within a trial of an interactive television system, highlighting the particular need to go beyond a focus on technology, to consider how it blends with wider concerns regarding content, governance and knowledge management. This is pertinent when considering particular strategic ends (in this case knowledge generation arising from consumer-user research). It maps the organisational development of the trial, and outlines difficulties experienced in evoking strategies for producing a concerted user research

programme.

This study began with the intention of being 'user-focused' – that is mainly concerned with matters to do with the appropriation, use and 'sense-making' of interactive television users as it came to be situated in homes. However, the study which emerged came to focus more on how *usability* – as a desirable and *objective* quality of products, as a *subject* of study, and as a *technique* for generating user knowledge - situates (or fails to situate) within wider contexts of the organisation of innovative activity and individual experience. As such it is not itself a study of *users* (although user interviews are included as Appendix 1), but much more a study of *user research* in relation to design and management processes in the trialing of new technologies.

Television and the nature of the 'domestic' and the 'everyday'

Around 15,000 years ago, humans began to value the prospect of living together in settlements, and at the same time began to live in separate dwellings within these settlements. In doing so they created for the first time a sense of public and private space, a sense of an 'inner' and a 'public' existence. This was a highly significant landmark in the history of human social and cognitive evolution, as these gave rise to particular cognitive categories. *Homes* dictated for the very first time a very real difference in social, psychological and physical space (Wilson, 1988; Dovey, 1978; see below).

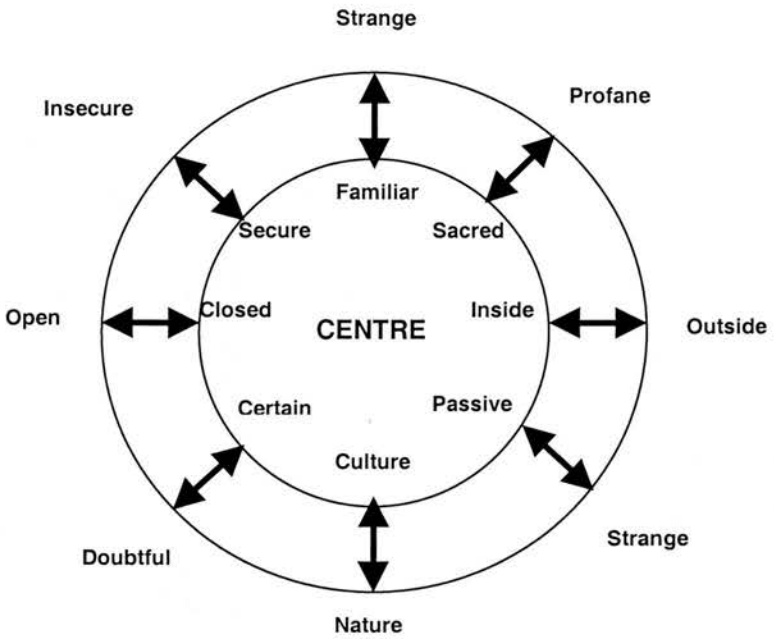

Fig. 1.1 Set of dualities indicating the emotional/psychological tensions and boundaries between home and the 'rest of the world' (after Dovey, 1978)

Dualities appeared between the 'inner' 'private' 'cognitive' world of the home, and the 'outer' 'public' 'social' world of nature or the settlement. These spaces gave rise to quite distinctive behaviours and rituals within and without the home, and the public and communal aspects of home suggested the ordering of space in further dwellings. Most were sympathetic to the climate and other natural conditions, as well as particular human needs and requirements dictated by utility and function, as well as culture (Rapoport, 1969). The formation of physical, behavioural and cognitive space helped to both designate *and* inform the design of space, and so our use of space denotes cultural and environmental predispositions *as well as* ourselves as individuals. The reflexivity inherent in the co-shaping relationship between people and the built environment is one of the most quintessential forms of technical interaction. Olivier Marc in *Psychology of the House* states:

> "Are we perhaps on the verge of grasping that the environment is ourselves, for it has given us form, and that creation is nothing but a dialogue between the inside and outside? Do we not have to exhale and inhale in order to live? . . . our unconscious self prompts us to act,

> produce and do. It is through our action and their products that we reveal ourselves to ourselves." (Marc, 1977: p.80)

The reflexivity of home and identity has had a critical role in the evolution of cultural identity, and a sense of time and place in the world. Since early settlement, we have barely evolved from a purely biological perspective. But how we make, how we find and appropriate the things we need on a daily basis has changed. Roger Silverstone (1994) as an example speaks dramatically of the process of *domesticating* technologies – how they come to be appraised and are incorporated into the domestic space. He likens appropriating technologies to a kind of 'hunter-gatherer-like' process of; " . . . bringing in objects from the wild: from public spaces of shops, arcades and working environments; from factories and, farms, quarries." (p.98) More than bringing them in from a chaotic 'outside', we 'tame' these objects into the patterns of our everyday life and activities. Somehow we make them usual.

Our sense of the world, and the means by which we attain and present this sense, most certainly has changed. How we derive worldviews, how they are shaped, and how we communicate their contents to each other has been privy to considerable intensifications over time (Wilson, 1988). For instance, the means to *socialise*, to *entertain* others and ourselves, to remove ourselves from the toil and stresses of everyday labour, in public as well as private spaces, has changed radically within the last 100 or so years. Ornaments and objects in the home made possible what Claude Levi-Strauss (1968) described as *bricolage*- the process by which individuals and cultures use the objects around them to reconfigure the boundaries of their cognitive categories. For advanced western societies this inevitably means electrical devices, most ostensibly home entertainment devices, which have become more or less a staple, emerging from the electrification of homes between the world wars (Forty, 1986).

At best, the reflexivity afforded by our interactions with new technologies helps define our identity, our sense of community, it evokes in us new needs and

requirements *as well as* directs the avenues for innovation and improvement.[1] "Man is not only homo sapiens or homo ludens, he is also homo faber, the maker and user of objects, his self to a large extent a reflection of things with which he interacts." (Czikszentmilhalyi and Rochberg-Halton 1981, p.1) Much of the recent literature regarding consumer research points to the way we define our self- and public-identities comes from what we *consume* (i.e. Lunt and Livingstone, 1992; Lunt, 1995), but while the products and services we consume may define us, they also come to be conditioned and shaped by the existence of other products, other objects, including the designed and ordered environments in which we live.[2]

Today, on a daily basis, most of us move between the spaces of home, work and leisure. Most of us consume a mix of information for a variety of purposes. We also move between different roles, some of which are closely associated with these spaces, some of which are provided for entirely by technology (i.e. Turkle, 1995).[3] But the spacio-temporal boundaries that previously distinguished and identified these spaces and roles in people's lives are blurring. Some of this can be attributed to wider socio-economic shifts and trends, some of it concerns technology, and in particular,

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[1] As Margaret Wheatly (1996) has it:

> "Every living thing acts to develop and preserve itself. Identity is the filter that every organism or system uses to make sense of the world. New information , new relationships, changing environments – all are interpreted through the sense of self. The tendency towards self-creation is so strong that it creates a seeming paradox. An organism will change to maintain its identity." (p.14)

[2] In *The System of Objects* (1968/1988), Baudrillard explores the possibility that consumption has become the chief basis of the social order. Consumer objects constitute a classification system and have their effect in structuring behaviour. The object has its effect when it is consumed by transferring its 'meaning' to the individual consumer. A potentially infinite play of signs is thus instituted which orders society while providing the individual with an illusory sense of freedom (Sarup, 1992: p.161). Baudrillard argues that participation with objects makes us think of the functions of the things in our lives. In doing so, we reduce ourselves to functional beings. We make ourselves functional to the things most important in our age, e.g. commercialism and technology. We are stripped of symbolism and expression. We act only as a cybernetic consumer, responding to a market of signs. Consumers attempt to create a fantasy life out of objects rather than human relationships but are constantly frustrated by their shoddy construction and tendency to go out of fashion. While this seems removed from concepts such as usability-as-a-quality Akiko Busch (1999) suggests otherwise: "If we were to give up our cultural biases, would we find a coffee mug warmer or an ergonomically correct spring-loaded ice cream scoop any less exotic than a silver pickle fork or cucumber servicing spoon?" (pp.57-58)

[3] Sherry Turkle focuses on the individual, the *user* within his own and outside environment in cyberspace. She states the question, "Are we living life on the screen or life in the screen?"(p.21) For the large part, this all depends on the individual 'user', and how seriously the user takes the Internet as a tool and uses it.

the availability and uptake of information and communication technology in industry and for domestic use. Internet-enabled PCs, i-Tv and mobile communications join the telephone, newspapers, letters, and the broadcast technologies of television and radio, to inform and entertain, and to permit teleworking and other forms of bridging the home, work and 'in-between' environments. While the latter technologies *brought* information to homes and to private individuals regarding activities and happenings in the 'rest of the world' - the world beyond immediate sensory an social experience - the former are now *connecting* private individuals, allowing them to *interact* with, albeit in limited ways, with the 'rest of the world'. They are able to do this from wherever they are - at home or on the move.[4]

In 1915, David Sarnoff (who became Chairman of RCA) first foresaw radio as a mass medium built around a *broadcasting network*. He later extended this to a vision of television. Here he proposed a technology that would rearrange "living rooms everywhere," and extend, not only the functionality, but also the *experiential* impact of radio:

> "Let us think of every farmhouse equipped not only with a sound-receiving device but with a screen which would mirror the sights of life. Think of your family, sitting down of an evening in the comfort of your own home, not only listening to the dialogue but seeing the action of a play given on a stage hundreds of miles away: not only listening to as sermon but watching every play of emotion on the preacher's face as he exhorts his congregation to the path of religion." (quoted in Wheen, 1985: p.16)

This scenario is further characterised by it being a *domesticated* vision of a technology, situated, embedded within the rich contexts of function, media content, societal values, family, emotional power and familiar programme preferences. The technology and its contents, its 'messages' are integrated, *naturalised*, within the home, within the family. Indeed, Lyn Spigel (1992) points to the way in which television featured as an integral part of modern home and family organisation in

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[4] Consider a recent publicity campaign by Nokia the mobile phone manufacturers. Entitled 'Nokiagame' its catchphrase is "in reality it's a game." Advertised initially on television, 'players' had to register on a web site and provide their mobile phone numbers. What followed was a kind of 'paper chase' which entailed a truly cross-media experience, with players having to locate and decipher clues provided by mobile messaging, web sites, newspapers or broadcast television.
http://www.nokiagame.com (9/10/00)

1950s American 'home economic' style of magazines. They conveyed the sense of 'wholeness' or 'completeness' that a television would contribute to creating the modern home environment. The environment of the home, as well as the context of family life and familiar everyday routines, have each served as potent archetypes for advertising scenario building since its very inception as an industry. Amongst many other domestic products, they have provided very potent symbols on which to base the publicity for prospective TV-centric technologies such as i-Tv. It was very consciously described in press releases and publicity as a 'lifestyle technology'.[5]

Contextualising, embedding and naturalising

Edward Hall (1989) has it that context: ". . . is frequently the most obvious and taken-for-granted and therefore the least studied aspect of culture that influences behavior in the deepest and most subtle ways." (pp.16-17) However 'contextualising', 'embedding', 'naturalising' have come to be of considerable interest recently within many areas, from the study of new media, to modern brand development. Ashcraft and Slattery (1996) suggest, for instance, that successful brands in the late '90s are those that 'embed' the values and experiences of customers in products and marketing. They are backed wholeheartedly by Pine and Gilmore (1999) who speak, not of 'digital' or 'information' economies, but now of the 'experience economy' – a trend which is removing us ever further from the 'rationalist consumption' of the classical economist (i.e. Miller, 1995). This is where experiences are paramount to customer satisfaction and enrolment. This finds parallels in design where the widely cited advocate of human-centred design technique, Donald Norman and his associates are now coining the term *user experience* to encompass: "all aspects of the

[5] Lefebvre's in *Critique of Everyday Life* (1958/1991), argued that everyday life has ceased to be a "subject" rich in subjectivity: it has become an "object" of social organisation. He meant that individuals have less control in self-realisation (subject) and adopt market categories to describe themselves (object). Individuals objectify the self and themselves. The self has become, through market categories, an object of market dimensions and dynamics. This is a simple psychodynamic method of explaining the commodification of the consumer. More important, it sets in place a mechanism that defines the individual from the outside, rather than from the inside. I put forward an adaptation on this theme in Nicoll (1999) where I suggest that 'users' were 'used' as 'currency' in enrolling the support of senior managers, external funders and partners, and ultimately, other consumer-users. Access to the users, and more importantly the user research was commodified as part of the package of learning (along with access to the technological system) afforded by the Cambridge

end-user's interaction with the company, its services, and its products." They go on: "The first requirement for an exemplary user experience is to meet the exact needs of the customer, without fuss or bother. Next comes simplicity and elegance that produce products that are a joy to own, a joy to use."[6] Such thinking represents a shift towards people interacting with the *entirety* of, and not simply an *aspect* of, a technological, service and fulfilment system. Such an aim requires contextual thinking beyond the capacities and functions of one's domain as part of an overall system.

Television

Television is no minor phenomena. It is truly pervasive. It is truly global, ubiquitous, shared, private - a key domestic technology. Jean Baudrillard (1983: p.55) has suggested a two way process of dissolution: " . . of TV into life, ... of life into TV." Stephen Heath claims that media, and in particular, television, forms a "seamless equivalence with social life"(1990: p.267), and Roger Silverstone (1989: p.77) argues that: "Television is everyday life. To study one is to study the other." These commentators point towards the entirety of the consumer-user experience of the technological phenomena that is television. But are these commentators exaggerating?

Within the home, the television receiver sits within a wider technical constituency of other consumer 'white' goods refrigerators, microwaves, dishwashers, vacuum cleaners and so on. These technologies create a gestalt, a bricolage of function, co-existing, sometimes aesthetically, with furniture, décor and architecture to shape the modern home. Each technology has their place, each has distinctive functions, but the class of mediatechnologies – television, radio, hi-fi - remain distinctive in terms of what we 'use' them for. Whereas the others may be read-off as 'labour-saving devices', the mediatechnologies have a less tangible, almost esoteric value and worth.

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trial.

[6] http://www.nngroup.com/about/userexperience.html

They are for passing time, for leisure, for information, for education, for 'keeping-in-touch', for entertainment. But are they even more than this?

> "More than any other product, television follows, interprets, and modifies the relationship that the individual maintains with the spaces and rhythms of life. At the same time, television posses the magical capacity to become a mirror not only of contemporary everyday life but also of the profound transformation it is undergoing. It is at once object and 'meta-object'. While television features as an object in our everyday existence, that same existence is reflected back at us in the subject-matter of the medium. To try to understand the role, which this dual nature of television plays in our lives, we need to explore the interaction between technological and social developments and their joint impact on the individual." (Morace, 1995: p.13)

Television situates within the constituencies of *everyday life*; this is why it is a 'meta-object', and it is here that its centrality, its semiotic centrifugality begins. First, it resides in the *home*, our central location in the world, the place where we depart from to do our will in the world, and where we return to when we are finished. Home is what Dovey (1978) describes as the 'ordering principle in space'. Second, within the home, television is often positioned within the 'living' room, the lounge – a 'central' location in the home. Third, even within the living room the television is often positioned as focal point in the living room, with other furniture arranged to assure a clear line of view from as many angles as possible. Televisions can also be found in kitchens, a further 'hive' of communal household activity. Televisions can also be found distributed in bedrooms for private viewing and for game playing.

Following Dovey, television could indeed be described as an 'ordering technology in time, information and space'. This is because it commands yet further 'central' roles in our lives, as 'informant' and 'friend', and temporal guide - all key activities again situated within the daily routines of everyday life. A plethora of surveys (see for instance Argyle, 1992) have drawn distinct attention to the competition of television and shopping as the most prevalent leisure activities across demographic groups. It is because of this prominence, the centrality in everyday affairs and consciousness that the television has, that marks it as a special case for study. Television as *technology and cultural form* (Williams, 1974) or as *technology and medium* (Silverstone, 1994)

opens new vistas that extend in many directions past simple considerations of singular qualities of products such as their 'usability'.

For instance, television as a means of selling product directly – i.e. through channels such as QVC - or indirectly - through features and advertising – is well-established, but its traditional linear format prevents people from *shopping* – i.e. browsing, searching, locating the things they want, when they want them. Making television interactive, networking home shopping and other services to its basic function in the home opens some level of 'shopping' to take place, but it also raises some immediate lines of question. For instance how does conflation of two very common place and prominent activities - i.e. television 'viewing' and 'shopping' - enhance or extend people's *experience* of television? How about the *experience* of shopping, or indeed, their *experience* of 'home'? Will such practice truly free up time for other activities? Does it relate to the similar experience that children had when they first connected video consoles to the television, or to time shifting when VCRs first freed the viewer from the hegemony of the programme scheduler? While these crucial questions were not answered by the Cambridge Trial, they featured as some of the questions which certainly drew partners to explore the system.

Similar to Sarnoff's vision of broadcast television, pundits of i-Tv, such as Om, made constant reference to i-Tv's 'revolutionary' and 'epochal' nature. They expressed little reticence to propagate myths regarding its potency to radically alter existing domestic practices. Such visions were perhaps made more readily digestible at the public [and journalistic] level through a wider fascination at the time for tangible symbols of new kinds of lifestyle extending into the new millennium. But such potency is at its most powerful when it is presented as a whole, where social and the technical elements are presented in an embedded, naturalised, and contextualised fashion, couched in a semi-utopian rhetoric of design and social change, and particularly, *domestic* change:

> "Today many new technologies form part of, and develop as, nodes in a network that has no central unit. Rather, all the units are linked together, sometimes performing the function of requesting information, at other times that of supplying services. Whatever the actual use is made of this potential for connection, the fact remains that the experience of domestic technologies

> is evolving toward the image of the 'family', and that the ability to make connections strongly influences the image of individual products and the customer's decision to purchase them. In both real and symbolic terms the television set stands at the centre of this demand for interactivity, becoming the prime product of the entire system of connection." (Morace, 1995: p.15)

The rigid neo-positivist usability approach of the original proposed study within this thesis came quickly to be sympathetic to the pioneering work of researchers such as Roger Silverstone, Eric Hirsch and David Morley (1991), particularly their study of the use of mediatechnologies in London households.[7] This was problematic study methodologically which in essence opened the 'black box' of the complex social and psychological contexts that propagate, abate and otherwise define domestic ICT use. This study also drew attention to the distinct methodological complexities in *approaching* the study of technology use, in everyday life, in private domestic spaces in advanced societies. Their study turned many pre-conceptions regarding the much-practised activity of consuming and using media and media technologies within the home. An important contribution entitled *Consuming Technologies: Media and Information in Domestic Spaces* (1992) edited by Silverstone and Hirsch contained a number of essays from various authors advocated the perception of information and communications technologies as *social* and *symbolic* as well as *material* objects. This came to have bearing upon the orientation, as well as the treatment of the notion of *usability* in the present study with regards to both traditional *as well as* interactive media technologies.

Interaction

'Interaction' is the chief functional characteristic defining the new forms of delivery mechanism for domestic media. But I have already drawn attention to the fact that interaction has much more essential and pervasive facets. If considered in its broadest, holistic sense - as a cognitive, sociocultural, *as well as* a technical form of

[7] Their work was itself influenced by earlier work of David Morley – particularly *the Family Television: Cultural Power and Domestic Leisure* (1986) – Sandra Wallman's *Eight London Households* (1984) – and Bott's (1957) *Family and Social Network*. These studies focused in depth on relatively small samples of households. The Silverstone, Hirsch and Morley sample was also relatively small (n = 20) as was the sample of trialist households in the present study (n =16).

human process - interaction continually shapes the lives of individuals, as well as the civilisations and cultures to which they belong (Wheatly and Kellner-Rogers, 1996).

From this position individual and cultural development owes *all* to interaction. At every given moment in time, actions and reactions occur at many different levels of neurological, biological, physical, environmental and social systems. From the biophysical changes in one's body and brain to the mental processes involved in interpretation of our environment, to the meshing of social and technical elements within some manufacturing processes that give rise to a product which comes to be desired.

Iterations, reflections, paradigm shifts, or 'bifurcations' are the product of intelligent forms of interaction.[8] For instance the philosophy of Merleau-Ponty (1962) suggests that our skills are acquired by dealing with things and situations, and in turn they determine how things and situations show up for us as requiring our responses. Also Michael Polanyi's theory regarding *tacit* knowledge (see Polanyi, 1962, 1966) describes how individuals develop and use knowledge in a process which is at once action-oriented and also focussed on the process itself. But it is through our interaction with *technology* that the roots of innovation in design and innovation of use occurs. As Alberto Melucci (1989) has it: "Changes in everyday experience not

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[8] Manuel De Landa (1997) speaks of a 'thousand years of non-linear history'. His thesis, inspired by the work of the physicist Arthur Iberall (1972, 1987), looks beyond prevailing attitudes that have history relying on texts, discourses, ideologies and metaphors. Rather it considers the interplay between three domains that have shaped human societies – economics, biology and linguistics. Bifuractions' are similar to 'paradigm shifts' as they represent "when a system changes from one stable state to another . . . minor fluctuations may play a crucial role in deciding the outcome." (De Landa: p.14) What is interesting here is the possibility of small stimulus-big response typical of chaotic and complex systems. Such an idea placed in the realm of design and planning is suggestive of what often thwarts forecasts and predications – interactions of apparently unrelated aspects of the environment of a technology or the belief system produced through and around its use:

> "Non-linear creativity is a major source of unknowability, in the sense of knowing based on linear reductionist traditional science. Innovating complex technologies may feature a dynamic in which heretofore distinct sectors fuse and spin off entirely new families of technologies in unpredictable ways." (Rycroft and Kash, 1999: p.21)

Here is a pragmatic argument for the use of interpretist approaches to the study of technology. Sometimes seemingly irrelevant events that somehow draw the researcher's attention either because they are striking or because of their frequent occurrence, may later turn out to be quite important (Roche, 1973).

but also reflect new needs in the lives of individuals." (p.114) Shifting more specifically to technology Neil Postman (1993) states that:

> "New technologies alter the structure of our interests: the things we think about. They alter the character of our symbols: the things we think with. And they alter the nature of community: the arena in which thoughts develop." (p. 20)

In the context of "a phenomenology of human-machine relations", Don Ihde has analysed the selectivity of technology, arguing that human experiences are transformed by the use of instruments, which "amplify" or "reduce" phenomena in various ways. As he put it: "Technologies organize, select and focus the environment through various transformational structures." (Ihde, 1979: p.53) Prior to Ihde, Marshall McLuhan and Harold Innis had also explored the selectivity of media, although their focus had been primarily on the social "effects" of various media of communication. Innis had argued in *The Bias of Communication* (1951) that each form of communication involved a "bias" in its handling of space and time (see Carey 1985). And McLuhan, in such books as *The Gutenberg Galaxy* (1962) and *The Medium is the Massage* (McLuhan & Fiore, 1967) had asserted that the use of particular media "massages" human "sense ratios" (allusions to which are also found in Innis). More recently, Neil Postman has reinterpreted McLuhan's aphorism that "the medium is the message" as meaning that: "embedded in every tool is an ideological bias, a predisposition to construct the world as one thing rather than another, to value one thing over another, to amplify one sense or skill or attitude more loudly than another." (Postman 1993, p. 13)

Interactions breed emergent properties and phenomena such as expertise, or can highlight faults in designs (i.e. Petroski, 1994). Faults are where representation and anticipation (of function) are not actualised. This is a kind of Popperian view that learning from experience is not by positive but by negative instances. He believes that engineers have learned more about design from failures rather than successes. His examples are large engineering structures. But Manuel Castells (1996) views that the differentiating feature of the 'networked society' lies in the unique forms of interaction of knowledge, innovation and use which are now enabled by the new

communications technologies *and the thinking it promotes*:

> "What characterises the current technological revolution is not the centrality of knowledge and information but the application of such knowledge and information to knowledge generation and information processing/communication devices, in a cumulative feedback loop between innovation and the *uses* of innovation." (p.32: my italics)

But it is not just the structure of knowledge which will be generated in the new world where networked and intelligent technologies continue to meld with the fabric of everyday life. Tatsuno (1993) pointed to the new imperative for firms of all types to get 'closer' to – interact - those who will consume and use their product and services. "There is no substitute for interaction with, and the study of, actual users of a proposed design." (Norman, 1988: p.155) The need for deep knowledge of use and users is emphasised when a firm innovates products which are 'smart', 'intelligent' or 'networked', or are explicitly designed to 'create new ways of doing business' by 'opening up new lifestyles' for consumers:

> " . . . the multimedia revolution and the global information highway open up new opportunities for totally new business and consumer lifestyles"
>
> Peter Bonfield Chairman and Chief Executive of ICL speaking on the Cambridge Trial at its launch

This is because these technologies narrow the window that designers have to speculate and project regarding use and users.

Cultures and spaces of production and cultures and spaces of use

There will always be a complex interplay – interaction - between visions of use (and the users) of products, and how they come to be actually realised (or compromised) in manifest products (by 'real' consumer-users). This process of actualisation contributes to forming distance between what I term 'cultures and spaces of production' and 'cultures and spaces of use'.[9]

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[9] The collapsing of products and services is related by Kantor (1992: p.9-10) "Producers think that they are making products. Customers think they are buying services . . . Producers think their technologies create products. Customers think their desires create products . . . Producers organise for managerial convenience. Customers want their convenience to come first . . . Producers seek a high standard of performance. Customers care about a high standard of living" The distinction of

Buchanan *et al.* (1996: p.3) view that human beings, through the agency of design, transform not only their own immediate lifeworlds, but also "impose a culture-sustaining order on the chaos of experience." Fiske (1989: p.1) defines culture as the: "constant process of producing meanings of and from our social experience." I have already gone some way to outline how our worlds are ordered, partly due to our conditioning, culture, education and outlook, partly by the built environment, the technologies, products and services we rely on and use everyday, and partly by the social milieu of institutions, workplace, family and friends that form our individual social constituencies.

Culture then is conceived as a multi-level construct, which Edgar Schein (1985) conceptualised and described of comprising three levels or layers. These range from the obvious and concrete to the more subtle and abstract:

1) *Artefacts* and *creations* are manifestations of:
2) *Values,* which in turn are engendered by:
3) *Basic assumptions.*

Artefacts and creations comprise the most "visible" level of culture and include the: "constructed physical and social environment . . . physical space, technological output . . . written and spoken language, artistic productions, and . . . overt behavior." (p.14)

Of special interest to social and innovation research are verbal artefacts, and these include language, stories, and myths as well as behavioural artefacts such as rituals and ceremonies (Mohan, 1993: p.16). As Winograd and Flores put it:

> "We create and give meaning to the world we live in and share with others. To put the point in a more radical form, we design ourselves (and the social and technical worlds in which our lives have meaning) in language." (p.78)

The 'values' level is generally said to possess both conscious and subconscious facets that are distinguished;

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technology, product and service collapses in the information age. In this thesis I tend to use the term technology, product and service interchangeably.

> " . . . .by goals, ideals, and standards that represent members' preferred means of resolving everyday problems . . . socially shared rules and norms applicable to a specific context . . . as well as what 'natives" perceive as constituting boundaries of acceptable behavior." (Mohan, 1993: p.16)

While these concepts normally prompt certain behaviours, they may remain only "espoused" (Argyris & Schon, 1978), in which case there is a discrepancy between what the organisation and/or its members claim to value and in how they actually behave.

The most abstract level, that of taken-for-granted reality, includes the group's basic assumptions, or; " . . . tacit beliefs members hold about themselves, their relationships to others, and the nature of the organization." (Mohan, 1993: p.15) These assumptions underlie and determine "meaning systems" in the organisation. It is upon this "layer" (e.g., these assumptions) that the cultural infrastructure rests (Deetz and Kersten, 1983).

Such definitions of consumption, culture and design suggest that the environment, the aims and the contexts of the workplace, the place in which a technology is planned and developed, can be very far removed from the actual environments where it will be sold, appropriated or used (Araya, 1995). More than simple physical and geographical distance, this distance is cognitive, cultural and experiential. The contexts and logic that give rise to particular features and functions that distinguish one technology or service from another, may vary considerably from the logic and contexts which motivates and particulate appropriation or shapes the experiential dimensions of its consumption and usage.[10]

Several questions arise from the dialectic of design/production and consumption/use. The first concerns technology. To which extent is a technology a continuation of what came before, and how does this impact upon the processes of innovation and diffusion? To what extent can consumer acceptance be determined in the case of

[10] From the customer's standpoint a product is nothing more than a tangible means for getting a service performed. Is baking soda a cake ingredient or an odour eater? The answer may be either or both since the products derive their meaning and value only from the uses to which customers put them.

radically new technologies?

Innovation

The point I wish to raise here is that current frames of reference and comparison always bind us and make us 'path-dependent' or 'tunnel visioned' one way or another. Manuel De Landa cites perhaps the most recursive question arising within the realms of human creativity. Can we really ever create something new, particularly when emergence can only arise from evolutionary processes?

> "A key issue in the philosophy of technology concerns the most appropriate way of conceptualizing innovation. One may ask, for instance, whether human beings can truly create something novel, or if humanity is simply realizing previously defined technological possibilities. Indeed, the question of emergence of novelty is central not only when thinking about human-developed (physical and conceptual) machinery, but more generally, the machinery of living beings as developed through evolutionary processes. Can anything truly different emerge in the course of evolution or are evolutionary processes just the playing out of possible outcomes determined in advance." (De Landa, 1997: p.31)

The very existence in the public domain of existing products, services or ways of doing things marks them as what could be considered 'departure points' for the ideation of improvements or alternatives - what *can* or *will be* in the future.

With reference to biological evolution, George Herbert Mead states that; "the organism . . . is in a sense responsible for its environment." (1934: p.130) He adds later:

> "When there is [a] relation between form and environment, then objects can appear which would not have been there otherwise; but the animal does not create . . . food in the sense that he makes an object out of nothing. Rather, when the form is put into the environment, then there arises such a thing as food. Wheat becomes food: just as water arises in the relation of hydrogen and oxygen." (ibid: p.333)

Mead provides here the basis for a temporal and interactive vocabulary to be developed and one which can encompass mental as well as somatic phenomena in the instances of innovation and development. Once a product is in the market place, it becomes an immediate 'departure point for improvement, if not the producer himself

or herself, then by some competitor or another who will improve upon cost, function or quality.[11] David (1975) is one of a number of authors suggesting that continuous pressure from market forces have long been an incentive for technological change. In certain cases, particularly if one is trying to establish a standard, a brand, or a network, this is a desirable state of affairs (Kelly, 1997).[12]

Rogers (1983: p.11) suggests that an *innovation* is "an idea, practice, or object that is perceived as new by an individual or other unit of adoption." This suggests a subjective dimension to innovations – i.e. its novelty exists in the perception of the beholder. From a consumer perspective Foxall and Goldsmith (1994: p.531) view innovation as a brand, product, idea, service, or practice that is "perceived as new in the eyes of the members of a social system." There is a more objective dimension to innovations when it resides in the product's characteristics, those qualities that differentiate it from others in their class (Garner, 1978), or in terms of the behavioural changes which are required to use the product (Robertson, 1971; Engel *et al.*, 1990); or even in terms of the characteristics of the evaluation task that is required on behalf of consumers (Howard and Sheth, 1969). Hirschman (1981) also introduces the notion of a 'symbolic' innovation – this is where a different social meaning is created for an existing product. Cove and Svanfeldt (1992: p.305) have also described the notion of a *societal innovation* as the "result of an encounter where

[11] I think here of Om engineers who often opened VCRs and games consoles of other manufacturers to discover which components and layouts they were using.

[12] In many respects this is a common practice of networked-oriented businesses. Mobile phones, STBs, and other technologies are given away in order to develop networks, and then 'lock-in' subscribers. Robert Metcalfe, founder of 3Com Corporation and the designer of the robust Ethernet protocol for computer networks, observed that new technologies are valuable only if many people use them. Specifically, the usefulness, or utility, of a network equals the square of the number of users, a function known as *Metcalfe's Law*. The more people who use your software, your network, your standard, your game, or your book, the more valuable it becomes, and the more new users it will attract, increasing both its utility and the speed of its adoption by still more users. If you and I can call only each other, to return to the telephone example, a phone is of little value. But if we can call nearly everyone else in the world, it becomes irresistible (Kelly, 1996). For the phone system, or the power system, the initial investment in network infrastructure was high, which kept the price of access high. In the case of railroads and telephones, initial developers failed to appreciate the value of interconnection (in essence, the power of the Metcalfe curve). Railroads struggled with multiple gauges of track, which limited connections between systems, until the late 1880s. It didn't even occur to telephone companies to put a dial on the phone until 1931, even though the high cost of employing people as switchboard operators limited the reach of the network. In the predigital age, Metcalfe's Law could take decades to unleash network power.

the culture and competence of the firm perfectly match the current status of society."

From an industrial perspective innovation is a term which represents all the activities of bringing a new product, process or service to the market (Clipson, 1991). Such activities usually involve the generation, acceptance, and implementation of these products, processes and services (Thomson, *et al.*, 1969). Nyström (1990) sees it as 'bringing new ideas to use'. Innovation, then, as addressed in the last definition, is a process tightly bound with the concepts of use and utility. However, it does vary depending upon if one is a producer or products, or a consumer-user. It does not appear to be something *intrinsic* to a product.

Robertson (1967, 1971) delineates three types of innovations: the *continuous*, the *dynamically continuous*, and the *discontinuous*. The continuous innovation causes little disruption in behavioural patterns and involves the introduction of a modification on an existing product, while a discontinuous innovation is a new product that requires the establishment of new behaviour patterns. Dynamically continuous innovations lie somewhere in between. Henderson & Clark (1990) define a radical innovation as one which changes both the "core concepts" (e.g. components or basic technologies) and the linkages between these concepts (that is, the architecture of the product).

In many respects this thesis would question whether there are such things as 'radical' or 'discontinuous' innovations.[13] Most technologies have qualities that relate them to established functions and features of other products, and already established practices. At the point of use, *interaction* denotes the juncture where nature or the designer enters the worldview or environments of the user, and the user reflexively enters the worldview or environments of nature or the designer or the service provider. But how much of this relation between design and production and use and

[13] Henderson & Clark also define a further category - *architectural* innovations. If a radical innovation changes both the "core concepts" (e.g. components or basic technologies) and the linkages between these concepts (that is, the architecture of the product), the architectural innovation "only" changes the linkages between core concepts, "recycling" the elements. (These two types of innovations are compared to yet other types, *modular* innovations and *incremental* innovations, which are not

consumption is it possible to discover through simulacrums, representations, trials and prototypes? What are the advantages and limitations of technologically informed reports of consumption, such as that obtainable through system logging of use and usage?

The technologies and techniques of prototypes, trials, scenarios, are the means by which firms can explore possibilities with users. They, along with means to capture appropriate user feedback, represent a kind of bridge between these worlds, the means through which 'cultures of production' can be *tentatively* melded with 'cultures of use'. The aim is too reduce the risk of commercial failure by developing the opportunity to iterate upon design flaws and weaknesses before committing to the considerable costs of manufacturing and production. But the quality of feedback is only relative to the approaches used to capture users thoughts, feelings and actions regarding the product, and of course how representational the demonstrator prototype is in mimicking the fully operational system in place, which promote learning at the point of most information – access and *use*.

Knowledge of antecedents

The biologist Geoffrey Scott, writing at the beginning of the century suggested that "things are intelligible through knowledge of their antecedents," (Scott, 1914: p.168) while George Herbert Mead (1936) viewed that human action takes place in a present that opens on the future. It is in terms of the emergent present and impending future that the content and meaning of the past are determined. Human acts are teleological rather than mechanical, thus, as Strauss (1964) indicates, Mead's evolutionism permits him "to challenge mechanical conceptions of action and the world and to restate problems of autonomy, freedom and innovation in evolutionary and social rather than mechanistic and individualistic terms." (p.xviii)

The process of acknowledging antecedents must apply to varying degrees, in the case of where designer-producers *and* consumer-users come to apprehend and anticipate

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expected to have disruptive effects on already existing industry structures).

the value of proposed and actual products. Acknowledging antecedents acts as the 'departure point' for comparison. The development of this knowledge is certainly more than a simple linear process, a straightforward transmission of value and meaning 'downstream' to awaiting non-discerning and passive individuals. As previously stated, there are shared and disputed meanings across the entire value and distribution chains. They exist from the very earliest stages of product ideation through to the final disposal of the product, or the discontinuation of providing or using a service. They arise from a 'Janus-faced' calculus of the what came before, its associated benefits and problems, with what is promised in the present and future.

But under the influence of what Steadman (1979) refers to as 'historical determinism', every level of social strata, from the personal, individuated self, to the policy and regulatory activities of standards committees and governments identify opportunities, and make forecasts based upon historical or experiential reference. It is only by looking back that we can look forward and proceed and consider what can be changed to improve matters.

While the Janus-faced spirit is infused into the processes of iteration, planning and design, it crystallises (following Schein's, 1985, conceptualisation of culture) most ostensibly in the more tangible attributes of a technological product, especially those aspects which characterise it in a developer's or consumer's mind through its innovation and diffusion into markets and homes. As McLuhan had it a new medium reveals "the linements and assumptions as it were, of an old medium."(1960: p.567) However, the features that it is given, and the functions that it is assigned are not fixed but can open to misrepresentation, reinterpretation or even customisation (Pinch and Bijker, 1989; Orlikowski, 1992; Westrum, 1991) For instance, which of its components, aspects, ingredients have been *truly* based upon previously established phenomena, practices, beliefs, ideas and/or artefacts? How does this compare with which are *recognisably* new and novel? To whom, and under which conditions does it represent, constitutes and define itself as an innovation?

Pre-history of interactive television

To set some historical context to the core subject of the present study, the previous three decades leading to the Cambridge Interactive Television Trial have witnessed a succession of technical experiments whose purpose was to make television interactive. The nature of these experiments had a common interest - the creation of technology and business infrastructures, bound to type of programming which would augment the basic broadcasting model. The object was to enable new channels for the sale of goods, services and information, and to test out and realise new markets.

The idea of two-way television may be traced back to the earliest text transmission of a two-way 'videophone' conversation in the 1920s or even to Logie Baird when he transmitted two-way pictures over standard telephone lines between London and Glasgow in the late 1920s. (Wheen, 1985) Carey (1996) and Carey and O'Hara (1985/1995) trace the notion of interactive television programming back to *Wink-Dink* – a programme on American children's television shown in the 1950s. A 'low-tech' solution, children placed a protective screen over the set to draw upon when requested by the show's host. In 1972 the FCC in the US dictated that all new cable TV systems should have the capability to provide two way communications. In an early paper on interactive television Buckelew and Penniman (1974) outline six contemporary i-Tv 'experiments' that were being staged at that time. It is interesting to note that their paper promotes discussion of 'social implications':

> "Social, economic and political implications of importance are yet to be considered. Along with the further speed and ease with which daily life can be conducted with the help of electronic media looms the possibility of monitoring the user, with its concomitant danger to privacy . . . But for good or bad, the technology of interactive television is available today, and *will* be used." (p.54)

The Buckelew and Penniman paper shows the recursive nature of visions and fears regarding media. There is definite interest in its 'societal effects,'[14] privacy continues

[14] They cite that the two-way capability of this system would lead to revolutionary new public and private services including; remote diagnosis and prescriptions; democratic interaction with local state

to be a thorny issue with regards to digital networks,[15] and the negative influence of mass media on the violent disposition of vulnerable members of society is a continual source of public concern.[16] Indeed, much of what was being trialed in the experiments that they cite, has come to be trialed in subsequent attempts at producing i-Tv services, or indeed within the Internet.

Non-disclosure agreements and confidentiality clauses [and patents] often stifle learning between firms, trials and projects. Strategically this is precisely what they are meant to do. In many cases often 'what really happened' within the unfolding of a trial only comes to light some time after when a person leaves a company and considerable time has passed. The result is that learning is hindered at an industry sectorial level. Any accumulation of knowledge necessary to perpetuate 'path-dependencies', 'critical inflection points', 'paradigm shifts' or 'bifurcations' does not occur. This of course is more damaging to 'network-based' operations such as the Cambridge trial than traditional businesses making 'stand-alone' products. Such operations require a wide subscription to their technology in order to be successful (Noble, 1982; Kelly, 1997).

Throughout the 1990s there was a proliferation of attempts to make television interactive. Many of these sought, as did the Cambridge Trial, to exploit recent advances in digital technology and networks. Digital technology enabled the transmission of ever more sophisticated forms of multimedia data. One report from 1996 cites some 135 trials worldwide of interactive video services.[17] Another cited in the *Financial Times* publication *Multimedia Business Analyst* suggested the wide diffusion of interactive television services. "Interactive television is expected to enter the commercial phase of its development by mid-1996."[18] The forecast was that near

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and federal government; education; pay cable-TV; merchandising; advertising testing; audience surveys and polls; credit card verification; security systems.

[15] See Burke (2000) for a recent overview of these fears with particular regard to i-Tv.

[16] See Barker and Petley (1997) for an overview of the 'video violence debate', and the institution of the 'moral panic' within society.

[17] "Interactive Services-realistic Expectations, An Analysis of Video on Demand, Video Dialtone, The Internet, On-Line Services and their Applications" Dittberner Associates, Inc. Bethesda, MD. 1996

[18] Interactive TV "to reach 40% of European homes in 10 years." *Multimedia Business Analyst* Vol.1. No.12 , 5th April 1995

video on demand (NVOD) would lead home shopping, education i-Tv shows and online games, home banking in that order, and rolling out over 1997. Video on demand (VOD) would not appear until early 1999.[19]

The various trials involved the use of various kinds of technologies and including combinations of telephone, PC, and broadcast communications infrastructures. They include services which in appearance looked more akin to what we would recognise in the UK as *Teletext* and *Ceefax*, through various levels of technical and presentational sophistication to systems providing 'video-on-demand' (VOD) or near-video-on-demand (NVOD). All have implications regarding bandwidth – the amount of data that can be communicated through an infrastructure. Teletext services demanding the least amount of bandwidth, and full video-on-demand (such as was used on the Cambridge Trial) requires the most.[20]

The technology of interactive television

If one considers the purely functional dimensions of recent media technologies there are several basic components. Pavlík (1996) suggests that a way to map emerging forms of media by their primary technical functions of *production, distribution, display* and *storage*. In the case of i-Tv these can be broken down into the technologies that produce content material and interfaces (authorware, production equipment, films, documentaries, etc.). Distribution is enabled by the

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[19] This was the industry consensus on when selected services will reach at least 5% of European households.

[20] Historically the term *bandwidth* was used by radiocommunications engineers to refer to the amount of radiocommunications spectrum available or necessary for carrying an (often analogue) signal for a particular purpose. For example, a telephone call normally uses of the order of 4 KHz of bandwidth; a television signal requires 7MHz of bandwidth. With the event of digital communications systems, and in particular the Internet, the term bandwidth is a term capable of different meanings. Here it has been used more generally to refer to the measure of throughput capacity of a given communications network link or transmission protocol. In relation to digital transmission of data, the amount of bandwidth between sender and recipient determines how much data can be transmitted per unit of time. It is measured in bits per second (bits/s) or Kbits/s, Mbits/s and so on. A typical residential modem for example, may transmit in the range of 28.8 Kbits/s through to 56 Kbits/s. Assuming there were no other impediments this would determine the rate of flow for the data being sent. In the case of larger businesses, their data connections might operate at 2 Mbits/s, 10 Mbits/s or higher transmission rates. ISDN stands for Integrated Services Digital Network, and provides two 64kbps digital communications and one 16 bit channel for signalling. ASDL (asymmetric digital subscriber line)

communications infrastructure, which enable content to be delivered to homes (switches, cables, satellites, etc.) and for audiences to feedback data (the 'backchannel'). Connectivity is a determining factor to the success of interactive services. The technologies that enable *content presentation* (the STB, decoders, electronic programme guide, interface etc.) and finally the storage devices - the servers. Broadband interactive television systems, such as one used in Cambridge, are most often associated with the following technologies:

Set top box (STB) - these can be intelligent (i.e. capable of processing information themselves) or dumb (i.e. only decoding signals and not processing any information themselves). An addressable communications box is needed to decode the signals as they arrive at the television; depending on the system used it may also need to perform functions such as the decompression of the digital signal, or the handling of the return path. Remote control and navigation system users need a friendly interface to find their way through all the services offered and communicate their requirements to the central Control System. Om provided the STB for the Cambridge Trial.

Communications infrastructure - this is the means by which signals are exchanged with the Set Top Box and include the phone line (plain old telephone system - POTS), integrated digital network systems (a digital means of transferring information over phones), ADSL - Asymmetric Digital Subscriber Line, cable (with or without supporting technologies such as ATM - Asynchronous Transfer Mode, and or cable modems), and satellite (both digital and analogue). Transmission System high speed links are required to deliver the vast amounts of information in a timely manner. For the return path in a fully interactive system there needs to be a signal going from the user to the Control System carrying the user's requests. Cambridge Cable provided the cable infrastructure for the trial, Advanced Telecomunnications Modules Ltd. (ATML) and SJ Research provided switching technology.

Head-end technology - this comprises the servers and gateways that lie at the service providers end of the communication network. It can include system architectures which connect to other remote servers (i.e. in the company of service providers, or banks, warehouses etc.), or to satellite transmission reception. Storage hierarchy & control systems - even compressed videos require enormous amounts of storage space; the control system must be able to service all the requests coming in - these technologies allow for sorting requests for data. On the Cambridge Trial ICL provided servers.

Content - by this is meant any form of source material: movies, games, news, images, sounds, etc. which will appear on the user's television or PC screen. This content may be provided by those in charge of the head-end technology

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provides 2Mb/second downloads over regular copper telephone cable.

or may be provided by a number of other companies, which may rent space on the head-end server, or may have user-consumer request forwarded to a host server of their own at a specified geographical location. Compression capabilities in most of the services can only be achieved effectively by using digital technology; systems are required to convert the analogue signals to digital and store them in a highly compressed format. The authoring software for the Cambridge Trial was provided by Acorn. The content was provided by a range of media companies including ITN and Anglia Television. In addition interactive advertisements were to be provided by BMP DBB Needham; online surveys by NOP; online banking by Nat West; groceries by Tesco; and a range of other services by other firms.

In addition to the above basic technology there is a wide range of other technologies which support the system's operation and function. These include *digital encoding/decoding* technologies (for creating content and interfaces), *compression technologies* (to reduce the bandwidth used in the transmission of bandwidth intensive video and so forth), *operating system technology* and *subscriber management* (sophisticated systems for administration, billing and encryption will be required to ensure that the users pay for the services they use and that copyrights are preserved).

A chart of the Cambridge system is detailed below.

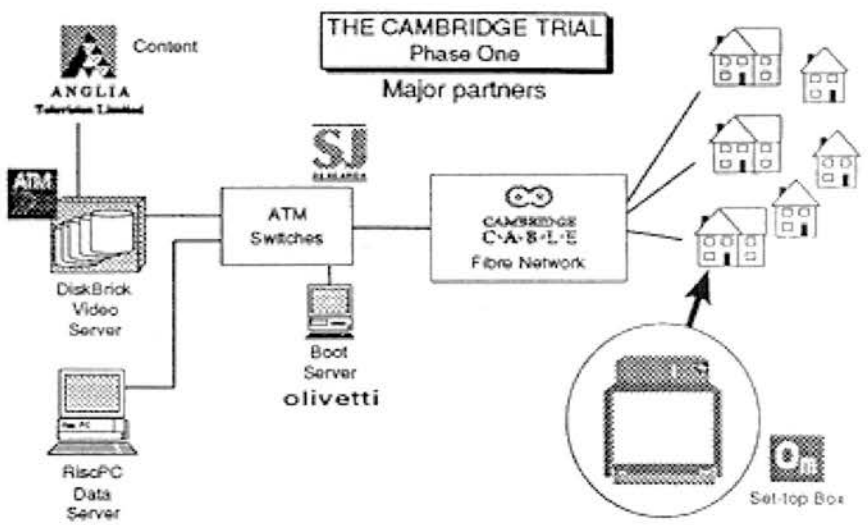

Fig. 1.4 A basic schematic map of the Cambridge trial (from Om literature)

There are systems which claim to offer interactive television which do not use any of the above technologies. *OKTV* which run an interactive service on Scottish television, use a remote control which is capable of sending coded tones down an ordinary telephone service. Used in conjunction with a combination of teletext they offer games and competitions, as well as additional television programme information.

Digital interaction

'Interaction' has a more limited definition when considered within the boundaries of the designed or built, than the cognitive or social environments. The architect James Marson Fitch comments that;

> ". . . every time the architect or urban designer erects a wall or paves a street, he intervenes in the behavioural modes of the population of that space. The consequence of his intervention may be major or minor, benign or malignant; they will always be real." (Fitch, 1972: p.163)

What Fitch is saying applies as much to architecture as it does to the field of digital communications and technological design. For instance, Steuer (1992) proposes 'interaction' as the degree to which users of a medium can influence the form or content of the mediated environment. Rogers (1995) defined interactivity as the degree to which participants in the communication process can exchange roles and have control over their mutual discourse. Jensen (1999: p.26) notes that 'interactivity' has recently become something of an oxymoron. But regardless of the 'myth' of interaction, as previously explained, it does imply re-configuration not only of technical resources needed to support it, but indeed the way in which businesses organise to relate programming, services and products to audience, subscribers and customers.

Rafaeli (1988) defines interactivity that recognises three pertinent levels: two way (noninteractive) communication, reactive (or quasi-interactive) communication, and fully interactive communication. Bordewijk and Kaam (1986: p.19) outline four possible combinations of information traffic patterns – transmission, registration,

consultation and registration (see below). These largely straddle the gap that exists between agency and structure with respect to the possibilities of interactive media.

Table 1.2 Combinations of information traffic patterns (after Bordewijk and Kaam 1986)

	Information issues by broadcaster/service operator	Information issues by user/consumer
Content controlled by broadcaster/service operator	Transmission	Registration
Content controlled by user/consumer	Consultation	Conversation

The existing broadcast model typifies transmission. This is where the choice of material, ownership of the material and the times it is broadcast to are the jurisdiction of the broadcaster or service operator. All consumers receive the same information. They receive it synchronously. Two-way radio or the telephone best technologically represents conversation. This is where two consumers decide through consensus control over content, the times and duration of communication. These two means have been well served by traditional studies of the media, as they represent the established media institutions or broadcasting and telecoms. Consultation is best illustrated when the broadcaster/service provider owns the material, and delivers it 'on demand' at the request of the consumer. The final communication channel – registration – contains those ways of researching and sampling the views and behaviours of the user/consumer where the broadcaster/service provider presents a questionnaire survey, or vignette online with a request for feedback. Alternatively, the consumers' interactions with the systems may be tracked, logged and analysed to infer various preferences etc.

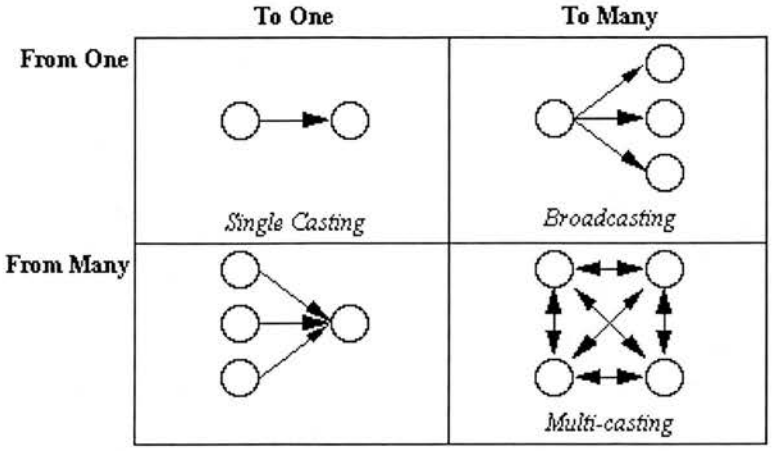

Fig. 1.5 The possible variations of media casting

It is obvious that interaction is dependent upon whatever there is available to interact with. From an interactive design perspective this poses a problem: How does one optimise interactive design to cater for users who may expect a similar myriad of interaction possibilities that they have in the real world? This brings us again back to the realms of the user, and the need for designers and other kinds of planners and forecasters to understand not only *users* (fixed representations) but *use implications* (dynamic processes):

> "In analyzing and designing systems and software we need better means to talk about how they may transform and/or be constrained by the contexts of user activity: this is the only way we can hope to attain control over the design of useful and usable systems." (Carroll, 1994: p.29)

This would certainly reduce to two major concerns – how interaction is represented to the user prior to any form of interaction – and how the interactive experience is channelled and led through by the interaction possibilities, the navigation and the semantic structure of the design.

While the interactive user-audience are intended to continue to make meaning from the type of text that have distinguished traditional content material (graphics, video, type - the media text), they are further being asked (through the new technology and functionality) to accommodate new forms of media vocabularies. These are the new ways in which media information may now be encoded - enabled through the addition of interactive design and information architecture. From the use perspective

this includes the new ways in which they decode these vocabularies and texts. This is embodied in use practices such as navigation and accessing. In interactive media the assimilation of 'messages' (the media texts themselves) are not only set by what is presented (i.e. shown on the television screen or newspaper), but also through new gestalts of interaction and experience.

The production (or encoding) of these comprise of several major avenues of design activity and thinking. Mok (1996) has classified these new media design dimensions. They include ***information design*** (which relates very much to the 'vocabulary' of how content is put across - i.e. the use of a graph rather than a table); ***interactive design*** (i.e. how it operates or what happens when you press a button or link on a screen); and ***information architecture*** (the paths by which the user can move between pages and items of information). What may be entitled the ***interactive choreography***, the way in which these elements work together, provides the consumer-user's experience of interactivity, through using the system, and may be understood as the experiential innovation aspect of new media.[21]

The notion of information and interactive design is important. In many ways it augments and complements technical prowess and in a way that has been previously unrealised. It can make or break content or a service. While multimedia screens often show aesthetic similarities to televisual graphics, the addition of interactivity suggests new needs to order information in ways which will not upset navigation (between screens and menus), the 'flow' of reading or viewing content material, and its interpretability. Good information design can economise upon digital storage, processing power and make the major contribution to a satisfying (or perplexing) user experience (Mok, 1996).

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[21] The notion of the 'experiential innovation' was hinted at in chapter one in the discussion of what differentiated the telephone as a new or radical innovation. There it was argued that it permitted the communication of human speech and discussion over distances. In terms of use it was an innovation which was essentially more usable than existing methods of communication such as telegraph, which already had been used domestically, but required training (in Morse code) to transmit and receive messages. The telephone's usefulness was a social innovation which unfolded over a considerably longer period than its innovation as a technology. An interesting note is that one aspect of new media which **is** a radical innovation or departure from the way in which it operates is this aspect of the unique way in which it displays, presents information, as well as the way the user-consumer must access it - namely the interactive elements.

The debate regarding primacy of action or structure is reflected in the nature of non-interactive with interactive media. The former is pre-occupied with the individual, considering them as purposeful historical actors, individualist and self-directing, who select from a series of possible interaction (or consumption) experiences because of their 'meaning' to them (i.e. favourite television programmes). The latter places more emphasis on the environmental structure as laying the conditions of, and environment within which, choice, or even reality, is absolutely pre-figured and pre-constructed. The reality though, is that every encounter is interactive, with an 'open' system, everything is experienced anew but within schema and frames of thinking rather like McLuhan's 'forward through the rear view mirror' concept. McLuhan viewed that humans are still evolving relative to their use of tools, and their exploitation of the world of other people, ideas, and environmental control (Benedetti and DeHart, 1996).

The television audience - from 'viewers' to 'consumer-users'

The television 'audience' is a homogenisation of a group that tends not only to be very diffuse in terms of its sociology, but also in terms of the range of action - what people are really doing or thinking about when content material is broadcast to them (Moores, 1993). The institution of commercial research into the audience – that which denotes programme ratings - tends to obfuscate or stop-short any depth exploration or understanding of basic questions such as whom is watching what? Why? To what kind of effect, result or possible end? The emphasis is to provide schedulers and controllers with some form of index of how 'likeable' or 'watched' their programmes were in relation to others. It has been said that the 'audience' is indeed a construction which serves best those who directly benefit from its reification (programme makers, audience research organisations, advertising agencies, media buyers etc.).

> " . . . the institutional organization of the industry seems designed not to enter into active relations with audiences as already constituted trading partners, but on the contrary to produce audiences - to invent them in its own image for its own purposes." (Hartley, 1987: p.134)

Media researchers especially those coming from reception research, media ethnography, and media and cultural studies have for some years now denied the perception of 'texts' as passive experiences. They have emphasised that the acts of 'reading' texts are not passive activities but rather processes of active interpretation. For instance Halloran (1970: p.20) proposed that:

> " . . .we think in terms of interaction or exchange between medium and audience, and it is recognised that the viewer approaches every viewing situation with a complicated piece of filtering equipment."

But some commentators feel that this level of activity (or interactivity) may differ between individuals, and that a notion of a universally active audience may be erroneous.

> "Activity depends, to a large extent, on the social context and potential for interaction. Elements such a mobility and loneliness are important. Reduced mobility and greater loneliness, for example, result in habitualized media orientations and greater reliance on the media. Attitudinal dispositions such as affinity and perceived realism are also important. Attitudes filter media and message selection and use. . . These attitudes, which result from past experiences with a medium and produce expectations for further gratification-seeking behaviour, affect meaning." (Rubin, 1994: p.427)

Most significant to the present study was that the Cambridge system represented new ways in which service and content providers, including advertisers could research and understand the television 'audience'. The very notion of the 'audience' as a fixed phenomena of study was something which has been brought into contention by commentators such as John Hartley (1987) and Ien Ang (1991). These writers and others have stressed that it is an overly convenient classification for what is in reality a very heterogeneous and complex phenomenon. This is the challenge towards a notion of 'mass' applied to society in general, and more specifically to the notion of media and audiences.[22]

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[22] Daniel Bell (1960) recognised the fuzzy nature of the category 'mass society': "What strikes me about these uses of the concept of mass society is how little they reflect or relate to the social relations of the real world." (p.25) The notion of 'mass' was a post-second world war construct (i.e. Blumer, 1939). In contrast with other social formations such as the group, and the public, the 'mass' was composed of members who were acted upon, lacking self-identity and self-awareness, and incapable of acting together in any organised way (compared with the other social categories of the group, or the

It denies the richness of what researchers such as Morley (1980, 1986, 1992) view as constituting either the act of, or socio-cognitive contexts of, the television viewing experience. The notion of 'audience' appears as a misnomer when applied to the realm of interactive media. Interaction by its denotation suggests action. Some of this will be more akin to typical 'reading' styles of media texts – i.e. when one is interpreting instructions for use, or a piece of written information, or in watching a digitised movie clip or animation – and some of it will be the pressing buttons and registering of actions.

A direct artefact of anyone using digital networks - whether this is manifested as key presses, the ordering of certain goods, menu choices of particular content, or simply navigation through menu options and pages - is that each action is registered and may be recorded by the system. This form of system-logging of user activity ensures that the very existence of people within such networks displaces and alters its constituency in one sense or another. Each action is *telematic*, extending the individual user through time and space initiating further actions and interactions throughout the technical and social commercial system. Each input registers as further data, extending beyond the goal-orientated action promoted by the interface to create effects and outputs or otherwise changes the state of the system in some pre-determined way.[23]

Appropriate software can convert such registered data into information about the online behaviour of particular households or even individual users. If this is combined with information derived from other sources, registration details, online surveys, face to face interviews, usability tests and so on, the result can be a relatively rich picture of individual users, even with respect to the relation between online and offline activity. Ideally such research methods can inform business strategy, logistics, or making other kinds of inferences which can feed into iterations on the technical

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public). However, as Raymond Williams (1961: p.289) has it "there are no masses, only ways of seeing people as masses."

[23] Of course this disincludes conversational aspects of system usage where one may have a one-to-one

system design, suggest extension of the network, and drive innovation of content and services.

In contrast to traditional modes of viewing televisual material, i-Tv audiences are able to feedback or engage at some level in online dialogues with broadcasters, system operators, advertisers, retailers, service providers and other users of the system. As suggested above interactive media systems can provide for many dimensions of communication - both implicit (through the monitoring of their 'button-pressings') and explicit (answering questionnaire requests online). Viewers for instance can purchase goods and services online, select from assorted menus of stored programme material, answer online surveys or interactively play games with one another.

The position adopted throughout this thesis is that such technologies do constitute a particular realm of problem for design and designers. But they also pose particular problems for a new emergent breed of proactive television 'viewer' – the *consumer-user.*

Chapter discussion

Interaction is cited as the defining characteristic, attribute, feature and function of the new era of business and digital communications. But interaction is an ancient human endeavour closely linked with exploration, craft, design and purpose, as much as control, constraint and management. While we may 'interact' with what is made available to our sensory systems at every moment in time, digitally enabled and mediated forms of interaction have a more limited definition, their possibilities relative to pre-existing forms of doing or accessing things, and to that which is made available, accessible or even known to the consumer-user.

In the case of making television interactive, which is suggested as giving one 'more choice' and 'more control' over what is presented on, and beyond, the screen. In a

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chat with someone online.

letter to the *Journal of Design and Design Theory* Vol.2; No.1), an interactive media designer Heiner Jacob is, unlike many technology developers and pundits, quite critical regarding the state of many so-called 'interactive' products and technologies:

> "Most so-called "interactive" media products only pretend to be interactive. They are at best "multiple choice" machines and therefore as interactive as a cigarette vending machine or a TV's remote control." (Jacob, 1997: p.155)

In many respects Jacob echoes Baudrillard when he notes that personalistion is only relative to what is made available to consumers, giving them the sense of free choice.

> "No object is proposed to the consumer as a single variety. We may not be granted the material means to buy it, but what our industrial society always offers us a priori as a kind of collective grace and as the mark of formal freedom, is choice. This availability of the object is the foundation of 'personalization': only if the buyer is offered a whole range of choices can he transcend the strict necessity of his purchase and commit himself personally to something beyond it. Indeed, we no longer even have the option of not choosing, of buying an object on the sole grounds of its utility, for no object these days is offered for sale on a 'zero-level' basis. Our freedom to choose causes us to participate in a cultural system willy-nilly. It follows that the choice in question is a specious one: to experience it as freedom is simply to be less sensible of the fact that it is imposed upon us as such, and that through it society as a whole is likewise imposed on us. Choosing . . . may personalize a choice, but the most important thing about the fact of choosing is that it assigns you a place in the overall economic order."(1968: p.141)

Jacob (op. Cit) lays out five functions that he sees as characteristic of true interactive functioning:

- First – access to contents in user's own time and in the sequence they wish to have them in. Adaptation to their abilities. Present them with the depth they want.

- Second – to enable the creation of personalised supplementations, links and arrangements and tailor the given material to needs.

- Third – It must be smart, i.e. adjust to preferences and correspondingly to change in line with the progress the user makes in learning.

- Fourth – reaction to growing familiarity with the tools and material such that it sets increasingly tough challenges and therefore stimulates the user anew each time. The architecture must not be so transparent that users

lose interest – there must be scope for random, spontaneous events that cannot be planned.

- Finally – For the user to always expect to find out something new about themselves (and others) in such interaction. All of this is technically feasible.

In short, i-Tv as a means of media content delivery, as well as the kinds of services it offered, represented a very distinct departure from the traditional mass media models of production, broadcasting, watching and using television. But it fell short on fulfilling the criteria for 'good' interactivity as outlined above. Nevertheless, the Cambridge system, rather like what is only now being realised by firms implementing Internet-based operations, represented an immensely potent technology, a harbinger of social and business change. But only if this change is made in conjunction with the use and development of technology.

Configuring a system to perform as a functional whole implicitly suggests that such projects must be to some extent 'technologically determined' at their inception. But even here it must be acknowledged that there must be continual appraisal of 'imagined uses and users' in the implied and anticipated social spheres of usage. Champions of usability engineering have stressed since the early 1980s the importance of an early focus on users and their requirements during the early specification stages of product development (i.e. Gould, 1988; Gould and Lewis, 1983; and Whiteside *et al.*, 1988). This is a process that must continue as the system diffuses into the sites and situations of use and its associated marketing is developed.

In terms of services and content, interactive television as it was envisaged in the Cambridge trial provided a number of services and content options which relate very strongly to the functionality of existing TV-Centric technologies. Many of the trials of cable-based broadband i-Tv have offered video-on-demand, shopping options, banking, interactive forms of advertising, and so on; all of which had been tested many years before in the trials outlined by Buckelew and Penniman (1974), and yet again in the late 1970s early 1980s in the QUBE trial (see appendix 2). Many of these

relate to long established everyday practices, chores and routines - i.e. going to the video shop, choosing and watching a video. Others bear relation to other kinds of practice - on-line shopping relating to mail order shopping or shopping over the telephone; online banking relating to phone banking; online education relating to Open University styles of education, and so on. Many of these services already have their digital counterpart available in some form or another on the Internet.

The digital age has brought with an almost endemic wave of broad claims regarding the potency of the new technology to change people and society. As Knights and Murray (1994: p.41) claim: "A market exists only so much as people believe that it exists and act accordingly. Similarly, a technological opportunity or constraint only exists in so much as people believe it to exist." The mass market of television, with its vast revenue potential, represents a considerable carrot in the face of those whose business is technology development.

Following Castell's notion that the real distinguishing character of the information age is the reflexivity inherent between 'interaction', 'experience' and 'learning' these were realised explicitly as key prospects within the development of the Cambridge trial, certainly by one senior manager. The trial was understood to offer a unique prospect of learning of use and usage of the new medium, of the interaction styles of users, and of the new kinds of organisation and business practice which were required to enable this. The senior manger responsible for content and service development, Marcus Penny, saw that there was an opportunity to get users involved with the design of content and services at an early opportunity:

> ". . . the potential here is actually we could get towards a situation where we can get interaction feedback at a very early stage . . . it becomes possible to put out a test service and get users involved very early and get them shaping and tuning the nature of service . . . having them on a continuous basis interacting with the services and feeding back information that will alter the way the services is provided . . . the sort of thing that one of the advertising guys mentioned is that one of their clients were saying 'you guys go out and research this for a couple of years and come back and tell what we're to do' . . . that actually won't work as this whole medium is changing the nature of the way the business works. It allows for the first time interaction with users right the way back fundamentally into every process of the business . . . all this

becomes possible, actually interacting and then you get some complex dynamic relationships which have just not been possible."

He viewed that i-Tv opened the potential for instant feedback from users. They would provide a marketing or product/service development department with the opportunity to test ideas out on user-consumers, and the feedback would dictate the adoption of the new product, service or process:

> " . . . most businesses are producer businesses somebody sits there in a room cerebrating creating something and there is a very, very long chain down to pushing it out, and the feedback back from users back to here is very, very imperfect . . . an individual programme producer can create something test it out and get some instant feedback . . . what will that do for the nature of television?"

In a system which is highly dynamic, constantly reactive, and ever changing - as the Cambridge system was in both a social *and* technical sense - it could be said that there would be little opportunity for things to remain stable enough to make inferences or formulate and ask relevant questions. Penny viewed that this was symptomatic of much wider cultural change happening across industry: " . . .we're coming to be in a reflexive world . . . what happens is that you run the reflexivity and I think it gets to the point of stability emerges its a question of managing through to that."

A very clear picture emerges of the innovation of i-Tv not being driven by simply engineering vision alone. Penny stressed the definite need for feedback, a symbiosis of developing services and content with inputs derived from the user-consumer's tastes, interaction styles and choices. He sees that one of most important elements of reorientation in this new way of doing business and producing media is one must take intimate account of the feedback and run one's business ultimately on the basis of interaction and feedback. Again, while this has characterised much of the claims of Internet and new economy 'personalisation and customisation' pundits (i.e. Peppers and Rogers, 1997; McKenna, 1997), it represented the thinking of the time.

But most importantly, *it was not* enabling and conscious manufacturing of the

possibilities for 'feedback loops' that will drive the mass consumer markets for i-Tv and other forms of interactive media. Nor will they alone legitimise the levels of investment necessary for developing a new form of domestic media. It is only a *relevant* technology, bound to a set of comprehensive set of consumer-attractive content and services, which will come to augment television's functioning and place in people's lives. Only when a robust technology and delivery architecture *combines with* a comprehensive range of good programming, will the value of 'feedback loops' emerge as a realistic proposition. They provide the 'fuel' - the real purpose for interaction. An entertainment system devoid of a robust technology, and devoid of attractive programming, is like the building of a motorway where there are no cars, and has no entry points.[24] So it is only with all its facets in place, that it will carry the promise of *mass* consumer markets - a significant commercial proposition which legitimises considerable investment. Legitimacy has been defined as a generalised perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system to norms, values, beliefs, and definitions (Suchman, 1995: p.574). Part of what formed this particular construct was the rhetoric of 'easily recognisable' benefits which i-Tv offered over orthodox broadcast television. But the trial, as symbol and in practice, was also an attempt to confront new ways of figuring and refiguring the user and consumer in processes of design iteration. This was on multiple levels:

- In changes to the *communications infrastructure* leading to the communications architecture becoming robust and reliable, capable of consistent operation in lieu of its purpose. Trialists would report on breakdowns and any other inadequacies in operation.

- In changes to *content and services*. Trialists would report on the quality, depth and breadth of content and services – was the selection satisfactory? Were there any obvious gaps in service provision? How did they rate the quality of the programming offered?

- To refine, explore and develop ways in which firms involved in creating the system, its services and contents could *derive learning from the consumer-user*. An artefact of digital system use is that all activities and communication through

[24] There is already good evidence of this commercially on the web where expensive, highly designed web sites draw no traffic.

it may be registered. This opens, along with new forms of online questionnaire surveys and vignettes new kinds of ways of deriving knowledge from the user. One dimension of the trial was to explore this.

- Finally, trialists would provide an essential *index on the commercial value of the system* and its contents. How much would they be willing to pay, for which content and services? This would help revise business plans and the economic dimensions of the trial and subsequent commercial roll-out.

Over the later half of the last century the technology of television drove the development of the massive, and complementary broadcasting industry. It also accelerated the growth of the advertising industry. As Smythe (1981) argues the rise of the television institutions and networks became the business of delivering audiences to advertisers. In the 1970s, in its wake of television's success came the first augmenting technologies – the so-called *TV-centric* technologies of video games machines and video recorders drove built the networks and sales (and hire) of their software of pre-recorded video and CD-ROM. At the start of the 1980s relatively rare and quite radical innovations, they are now commonplace in homes with televisions, where they have played a very significant role in driving the rise in driving multiple television set use in homes.

Conclusion

Without doubt, mass media - and in particular television - has primacy in shaping and representing human affairs (i.e. Stevenson, 1995; and the quotes offered earlier by Silverstone, Baudrillard and Heath), and such primacy hints at the *potential* for the trial to be a very significant social and cultural event. If successful, the technical and service prospects it represented would have had the potency to elicit change over a wide spectrum of industrial and personal practices. TV-centric technologies implicitly capitalise and reinforce television's unprecedented success as a consumer product. Consider a recent advertisement for Netgem, which is one of a number of platforms that allows access to the web through the television set:

> "1.16 billion households with Internet access without a computer. Your online markets are opening up . . . Netgem brings the web to its new frontier, liberating it from the computer. With the Netbox, you have access to every

> single TV household, worldwide. Bring your customers online now and become their favourite portal. Will you let the second e-commerce revolution pass you by? . . . T V sets with potential Internet access (1.16 billion worldwide) . . . Computer with Internet access (150 million worldwide)"[25]

Now Internet set top boxes and other TV-centric network technologies seek to become next generation consumer electronics that augment television's function and share its privileged space in the living room. The object is to convert 'viewers' into 'consumer-users'.

Discussion of mass consumer markets and the delight of users mix liberally with other forms of technologically determinist rhetoric to spirit not only investment and development, but to also create realities and myths regarding 'where things are 'at' and 'where they are going'. As Sharrock and Anderson, (1994) see it:

> " . . .being able to couch one's proposals in terms of user considerations is a powerful way of ensuring their acceptability." (p.16)

Elsewhere (in Nicoll, 1999), with respect to the Cambridge Trial, I have suggested that amongst other things 'users' may operate within design processes as 'rhetorical devices' by which design champions and mangers may win support and favour for projects. The promise of satisfied consumers, many of them, suggests certainty and reduced risk, and focus concentration upon more immediate requirements of expertise, resources and technical problems for development.[26]

But Frank Webster (1995) has pointed out that the ability to properly forecast IT trends is often obfuscated by an overemphasis on the transformative abilities of the technology, or the way in which it breaks with what came before. The radical alternative, the novel innovation will always make for the more interesting press release. The 1990s began with the promise that we would all be existing within virtual realties within a few years.[27] Such discourse and the tendency for editorial

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[25] Financial Times, Friday April, 7th p.7 2000 http://www.netgem.com

[26] Grudin (1994) suggests that this will include the more familiar and immediate 'logics' that are useful in technical problem-solving arenas, such as software or interface design challenges. This is what Araya, (1995: p.231) terms as 'technical thinking'.

[27] Indeed, technology through the advent of magazines such as *Mondo 2000* and *Wired* technology, in

sensation, tends to simplify discussion of impacts, denying the 'messiness' or the 'greyness' of the either the technical or the sociocultural complexity which typifies much of the development and deploying of technical products and systems.

Indeed, many of those involved with the case outlined in the present study felt that *they* were at the vanguard of a brave new movement, *the* one which was truly going to revolutionise the world. This belief and conviction energised and motivated the development – giving it a 'buzz'. This coloured expectations within and without of the firm, regarding what they were developing. No one was shy with respect to broadcasting claims of how it would change the ways things are done across many dimensions. From an industry perspective, 'making television interactive' would entail nothing less than a radical reorganisation and overhaul of the entire broadcasting, logistical, commercial and advertising sectors. From an individual perspective, it would evoke wide-ranging changes to people's relations with institutions and things 'outside the home,' 'outside' the immediacy of their personal lives. It would offer benefits ranging from timesaving - more convenient management of one's everyday affairs - by providing services such as home banking and shopping - to offering entirely new genres of entertainment such as online gaming.

The development of a robust communications network and technology would attract a wide range of companies that would *use* the system as a delivery mechanism for the sale and advertising of their products and services. They would come through their foresight to learn of the new way to do business through the new channel, or they come from fear that their competitor would beat them to it.

Such propositions seem commonplace today, embedded as they are within the well-publicised 'power of the Internet' to revolutionise the way we access and do things, but in 1994 there was considerable debate on whether this change would be brought

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itself, was becoming something of a central cultural phenomenon. There was an almost utopian feel in the tone of these publications. "The rush is on! Colonizing Cyberspace." (Front cover of Mondo 2000 Issue two summer 1990)

about by *either* i-Tv *or* the Internet. By the mid-1990s there were questions regarding whether the new media model would indeed be 'broadband' interactive television or the Internet - which was only beginning to dawn as a focus of serious commercial interest. Both platforms had technical and service advantages and disadvantages.

The creation and offer of these new services, and the belief that they would be subsequently taken up by consumers, helped drive the notion of i-Tv as 'a lifestyle technology'. To help the technology and service partners more fully understand and realise this potential a third, distinctive social group would have to be enrolled within the trial. These were the *trialists* – those who would act as surrogate consumer-users of the system. They were expected to *explicitly* feedback upon their experiences of the i-Tv service and system via a series of questionnaires, specially arranged meetings and interviews. They would also *implicitly* feedback through the logging of their interactions with the system. This would be tracked by a system-logging mechanism.

The need for user-feedback or to otherwise 'learn' from users characterises a general industry trend which became popular across industry sectors in the 1980s-1990s. For the large part it is an attempt to realise the extent of, and remedy, presumptions that can jeopardise the success of products and services before and after they diffuse into the marketplace. The key problem for futurists or planners (or even researchers) is that old challenges and fashions become new challenges and fashions in combinations that yesterday's futurists could never have imagined. Indeed, Martin (1991) sees that it was forces beyond that of the functional and technical attributes of the telephone, but indeed much wider, social, economic, institutional, and socio-political influences that shaped its innovation and diffusion. From the vantage point or *horizon* of old mindsets and frames, continuity is broken by unexpected, unimagined or unanticipated influences coming from what was previously considered some unrelated source. When enough of these instances happen, changes occur, are suggested or even demanded. In the new world of the 'knowledge economy' a small start-up company can undermine a huge incumbent (Kelly, 1997). Some icons of

British industry and retailing such as Rover and British Home Stores suffered badly in the late 1990s, certainly compared with 'dot.com' start-ups which received massively inflated stock market evaluations. Many of these firms did not manufacture any tangible goods, nor did many hold stock or inventory, neither did they in many cases handle customer care and fulfilment. But yet key players, mostly investors and venture capitalists, *believed* them to hold the power to undermine huge incumbents.

Two main strands of development occurred in the thinking that focussed this study and they have been introduced in this chapter. The first was reconceptualising the notion of 'usability' with relation to 'television'. This would account for television in its wider *phenomenological* context, as well as place as a usable technology within people's lives. The second, while linked to the first, concerns much more the organisational dimension involved in creating usable 'user knowledge' or 'knowledge of the user' which may, or may not, inform the design of everyday products such as television. This second strand came to impinge reflexively upon the original direction of the research project itself, calling for a refocus of the study away from [end-] users and towards the producers. Both strands draw attention to the nature of context in studies of products and services. They draw attention also to the complex socio-cognitive dimensions that constitute the notion of 'the familiar' 'the everyday', and ' the home'. Television and other media technologies clearly constitute a special case for usability. Cooper and Press (1995) for instance illustrate this graphically when they suggest metaphorically that: " . . . the Booker prize is not awarded to Jeffery Archer or Jackie Collins although their work is "usable" to more people than that of Salman Rushdie." (p.18) Usability, as either research objective, or as a distinguishing quality, seems to straddle the worlds of design, production, and use. In some cases the uses and the user of the product are often quite different from the producers and designers imagined (i.e. Grint & Woolgar, 1997). That way the design does not necessarily determine the actual use of the product. However, once the product is materialised, it defines some limits to its use and users. Ruth Schwartz Cowan (1983) says that we can use tools in many ways *but not* in infinite number of

ways. The possibilities for the user to reshape the artefact itself are of course limited or at least constrained by the design work on the artefact. However, this does certainly not eliminate possibilities for change. Non-intended consequences and use outcomes are often picked up by the designers and incorporated in the next product release development. Another possibility to reshape the artefact itself is that savvy individual users tweak and modify the artefact to use it for their (different) intended task. The realisation of user innovation is beginning to be understood as a real source for innovation (Von Hippel, 1996).

There have been a variety of quite distinct technologies whose aim is to augment the basic functionality of the television receiver and the roof-top antenna. Some of these have been very successful. Within this category lie video games consoles, video recording machines (VCRs), and teletext and videotext systems, as well as satellite, cable and digital decoders. Each of these, and others such as the videophone, comprise of totally new combinations of features at the time of their introduction (Ortt and Schoormans, 1993). Even the humble television 'phone-in' - where people are requested to register their opinion, take part in a discussion, or provide the answer to a question - represent concerted effort on behalf of broadcasters to bridge the physical, cultural and symbolic gap between them and their audiences, for the purpose of interaction. However humble from a purely technological perspective these types of programmes, and the wide public exposure they get via broadcast television, lay the foundations for awareness of interaction possibilities by the television audience. These technologies and practices have played a distinct role in shaping attitudes and perceptions regarding what television 'is', 'is not' or what 'it can' or 'cannot be'. For instance an existing core function of VCRs is to shift through pre-recorded material. This function required nothing short of a kind of re-inventing on the Cambridge Trial system, where fast-forwarding and rewinding digitised MPEG[28]

[28] Motion Picture Experts Group: A committee composed of technical professionals from different industries dedicated to forming a open standards for the transmission of digitised video and audio for computer and television networks. More usually the internationally agreed standard for video compression which can allow full motion video to be played on digital equipment. MPEG 1 has been approved by the International transfer rate of 1544 Mbps, compressed typically at 40:1 ratio. It is often used for low quality such as that used to transmit video across the Internet or from a multimedia CD-ROM. MPEG 2 (what was used on the Om Cambridge Trial) is generally compressed at 30:1, a

encoded films needed considerable development effort. More than a superficial relation, the very notion of 'video-on-demand' is directly inspired from the time-shifting properties of traditional video machines. In other words, these technologies have shaped perceptions regarding the value and purpose of what the box in our living rooms can do.[29] Moreover, TV-centric technologies and practices have altered perceptions of how television may be used. Not only do they permit new capabilities for broadcasters to interact with their audiences they provide new means through which retailers (and wholesalers, advertisers and market researchers etc.) may interact with their consumers. However, the use of the telephone is most distinguished from the telegraph in terms of its usability;

> "The telephone continues the verbal tradition because it operates with the human voice and requires no special codes, training or skills as did the telegraph. Phoning is as easy and natural as talking . . . The psychological importance of human speech is not always appreciated . . . every time we hold a conversation we relate to another person, not a thing; their replies to our remarks reinforce the sense of our existence . . . the telephone exists as an extension of nature in this way." (Cherry, 1977: p.123)

There was no need for users of the telephone to learn a 'meta' language such as semaphore or Morse code in order to communicate over distances. The telephone enabled electric communication to more natural and immediate, and therefore more usable. Such accessibility of use enhanced existing ways of exchanging ideas, social networking, co-ordinating, and business between people (de Sola Pool, 1977). The development of these antecedent technologies and practices – bound to their acceptance [or non-acceptance] in the market place - suggest something of what may, or may not, be successful in a mass domestic network. They may also provide hints at the initial functional aspects that an i-Tv service can deliver to the consumer. For the large part this is what inspired firms involved with i-Tv trials with respect to content provision.

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similar quality to VHS, but takes more bandwidth (6-8 Mbps), and is used for European digital broadcasting and DVD (qv). MPEG3 would address the needs of HighDefinition Television (HDTV). MPEG4 is used for video conferencing.

[29] The inclusion of networked games on the Cambridge system was in direct response to the contemporary popularity of id software's *Doom*. This game, originally released as shareware, was a landmark in networked computer gaming, allowing players to enter into the same virtual space in order to fight each other or collaborate against a plethora of 'enemies.' The intention was to adapt an earlier id game - *Wolfenstein 3-D* - to work over the system.

Chapter 2 – The social and the technical

"One of the most potent symbols and vehicles of our current high-tech society is the television set. The automobile, the aeroplane and radio have clearly left no one's life entirely untouched, but it is arguably television that has affected people's ***minds*** most deeply. Around the globe, the television set provides a very literal window on the world outside, liberating at the same time the inner, private world of the imagination. But is television truly a ghost from the gods? Or is it a Trojan horse, coming into our homes as a deceiver . . . ?" (Marzano, 1995: p.9)

Introduction

Visions, projections, perceptions, attitudes, beliefs – mental phenomena – have never by themselves guaranteed the success or failure of products. But they do make an important contribution. In 1879, Sir William Preece, the then chief engineer of the Post Office, was guarded regarding the potentials of telephony to change existing practices:

> "I fancy descriptions we get of its use in America are a little exaggerated, though there are conditions in America which necessitate the use of such instruments more than here. Here we have a superabundance of messengers, errand boys and things of that kind . . . the absence of servants has compelled Americans to adopt communication systems for domestic purposes. Few have worked at the telephone much more than I have. I have a telephone in my office, but more for show. If I want to send a message - I use a sounder or employ a boy to take it." (Preece, quoted in Dilts, 1941: p.11)

Compare this with a vision of Alexander Graham Bell:

> "At the present time we have a perfect network of gas pipes and water pipes throughout our large cities. We have main pipes laid under the streets communicating by side pipes with various dwellings, enabling members to draw their supplies of gas and water from a common source. In a similar manner, it is conceivable that cables of telephone wires could be laid underground, or suspended over head, communicating by branch wires with private dwellings, country houses, shops, manufactories, etc, etc. uniting them through the main cable with central office where the wires could be connected as desired, establishing direct communication between any two places in the city. Such a plan as this, through impractical at the present moment, I firmly believe, would be the outcome of the introduction of the telephone to the public. Not only so, but I believe, in the future, wires will unite the head offices of the Telephone company in different cities, and a man in one part of the country may communicate by word of mouth with another in a different place." (Quoted in Winston, 1986: p.338)

Both men are referring to the same technology, but many things distinguish Bell's *vision* with Preece's *evaluation*. Beyond the inherent class and status distinctions inherent in Preece's view, he performs a kind of substitution and calculus of function – i.e. one's ability and status to call upon the 'superabundance' of human servants which negate any *need* for technology.[30] Preece seems to miss what is perhaps most

[30] Picking up from the discussion in the previous chapter, here is an explicit example of the 'use' or 'utility' of human beings placed against the 'use' or 'utility' of technology.

network – different spaces such as home, work factories etc. – *connection* as the real power of the telephone.

Today, many forms of labour seem quite distant from providing for the lower echelons of Abraham Maslow's (1954) *hierarchy of needs*.[32] But it remains a truism that in the design of many products, if not all products, a wide complex of perceptions and anticipations, as well as needs, informs its shape, purpose and function. The rhetoric that sells and advocates a product within the firm to senior management; the 'pitch' that sells and advocates it to outside agencies such as venture capitalists and other funding agencies; the advertisement that creates and fosters impressions of use and value to the market - each are examples of communications above and beyond any simple, direct development or meeting of basic human needs. But more than this they align or dis-align common interest between parties.

Although reality always exists in a present, the telos of this reality is to be found in the future, the future is a factor, perhaps the main factor, in directing our conduct. It is the nature of intelligent conduct to be future-directed (Mead, 1936). Human action is always action directed toward the future. The past does not determine (although it does condition) human conduct; it is, rather, human conduct that determines the past. Visions, associations and perceptions - mental phenomena - motivate or mitigate, help or hinder innovation. Preece's appraisal of the usefulness of the telephone, bound to his position, his status, his influence, led to a hiatus in the technology being implemented in the UK.

Bell's visions of the telephone came to be realised, as this century, along with plumbing and electric mains, telephone networks have increasingly pervaded, linked

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Morse code had to be known to both the receiver and the transmitter in order to convey the message.

[32] Maslow (1954) attempted to synthesise a large body of research related to *human motivation*. In an ranked order of priority they included the needs to address: 1)Physiological: hunger, thirst, bodily comforts, etc. 2) Safety/security: out of danger. 3) Belongingess and Love: affiliate with others, be accepted. 4) Esteem: to achieve, be competent, gain approval and recognition. 5) Cognitive: to know, to understand, and explore. 6) Aesthetic: symmetry, order, and beauty. 7) Self-actualisation: to find self-fulfilment and realise one's potential. 8) Transcendence: to help others find self-fulfilment and realise their potential.

bound to his position, his status, his influence, led to a hiatus in the technology being implemented in the UK.

Bell's visions of the telephone came to be realised, as this century, along with plumbing and electric mains, telephone networks have increasingly pervaded, linked and informated businesses and homes. Now the word is the 'local loop' – Local Area Networks (LANs) – for the home. Each room wired with fibre optic cable enabling entire suites of intelligent and networked devices to work in concert, and to link their functioning in relevant ways to outside world (such as telematic control over domestic functioning, or fault self-reporting of electronic products).

Weick (1990) points out that most technologies are usually in fact *technological systems*; combinations of technologies used together. Technologies can be said to contain *hardware parts* - the machines and tools - and *software parts* - the knowledge that built them, and which is required to use them (Rogers, 1995). The knowledge involved in technology may be formal or tacit (Dosi, 1988).

Knowledge, visions, beliefs etc. are not only mental phenomena but also essentially social phenomena, socially constituted, the result being a complex of social and technical aspects, operating at many levels, culminating and interrelating in the creation and operation of useful technical systems. Knowledge and to some extent, individual powers of interpretation, planning and design are social phenomena, socially shaped and socially constructed. Polyani (1962, 1966) argues that tacit knowledge belongs to the personal domain, but is still embodied in the meeting, the interaction, between the individual and the culture he belongs to. This contrasts somewhat with Vygotsky (1978, 1986) who strongly points out that all knowledge is social in some way or the other, and thus contingent on social structures pre-existing in social systems. Thus to Vygotsky knowledge exists in the collective structure existing in social systems. Simon (1987) argues in favour of the view that tacit knowledge can be made explicit by 'unfreezing social habits'. Simon focuses on organisations, while Vygotsky focuses on social structures, and Polanyi has his

attention directed towards the meeting between individual and culture. Regardless of which view is adopted the essence of interaction between the individual and other human beings and objects remains uncontested.

My object in this chapter is to outline something of the recent thinking concerning how to *conceive of the whole* in the processes of technological and service development. 'Conceiving of the whole' has been the prerogative of *general systems theory* (GST) and related disciplines. With respect to technological development this means accounting for cognitive, social, symbolic and technical elements that combine or mesh to produce usable, manageable technical systems and technologies. It examines the merits and shortcomings of two particular approaches to this problem – *actor-network theory* (ANT) and *sociotechnical constituencies* and considers the applicability of these approaches to mapping the 'big picture' of the case study presented later.

The present study came to accommodate a view that both traditional broadcast *and* interactive forms of television required a modified or expanded view of usability as a defining quality of their operation. This I will cover in the following chapter. A second distinctive strand of development to the study included a shifting of focus from a pre-occupation with users (i.e. *their* reporting on the experiential aspects of the system), to considering user research within the wider social continuum, and more specifically, the organisational and knowledge generating aspect of the trial. This forms the main impetus of this chapter.

The Cambridge trial represented a formidable social and technical undertaking especially when viewed from an innovation or organisational perspective. Indeed, considerable effort was put into *engineering* the social aspects of the trial.[33] While the trial may have been driven by a range of opportunities, fuelled by a succession of strong and often flamboyant beliefs and visions, the governance and organisation of

[33] Indeed, upon completing the advanced chipset design at an early stage in the inception of the project, the Chief Scientist at Acorn, turned her attention to designing the layout and characteristics of the Om facility.

the trial evolved subject to the succession of unforeseen internal and external stresses and influences – commercial, technical, organisational etc. – influences which have always plagued intentions, plans and anticipations.

Since the work of Lucy Suchman's in the 1980s (i.e. Suchman, 1983, 1988, 1991, 1992), the design, innovation and diffusion of many technological systems have come under increasing scrutiny as subjects which are sensitive to the situations and conditions of use: "Situated action is an emergent property of moment-by-moment interactions between actors and between actors and the environments of their actions." (1988: p.179). She also stressed the contrast and disparity between *rationalist plans* and situated action, as well as the role of *language* in constituting human interpretation of situations (which she shares with Berger and Luckman, 1966; Winograd and Flores, 1988 and others who take a more interpretist and constructivist slant on inquiry).

To effect proper design, many systems simply cannot ignore depth understanding of local knowledge and experience on behalf of developers, and of social contingency which demands a closer collaboration process between those who produce products and those that use and consume them.[34] A service or product's value, and the proper establishment of their consumption and use, can only be properly realised, indeed comprehended, by their deployment into the environments and conditions of their operation, consumption and appropriation. In many senses this is an approach which came to reflexively shape the study itself, as it as shaped by the action of conducting the research (in a 'grounded theory' style of approach, i.e. Glaser and Strauss,1967; and see chapters 4 and 7 below).

The trial's evolution influenced and shaped the present study, most obviously with respect to access to the trialists. Who could speak to them, what could or would be asked, as well as where and when they would be asked, were each originally the sole

[34] Von Hippel (1990) also points out that some problems are hard to separate from the context and condition from which they arise, and Fleck, (1994) suggests that if configurational technologies are to be successful they; "demand substantial user input and effort and such inputs can provide the raw material for significant innovation." (pp.637-638)

prerogative of Om. However, it eventually came under the jurisdiction of a working group responsible for all marketing and user research issues within the trial. This was a group comprising of representatives from the consortium of firms who were producing content and services. Each belonged to quite distinct industry sectors. Each also had quite specific interests in both the processes and outcomes of the user research. They also manifested interests that sometimes conflicted, often due to differences in corporate cultures or ways in which the firms perceived customers, viewers, subjects etc. As an example each had quite different perceptions of the notion of 'user' or 'consumer' and this led to competing or conflicting interests in *what* should be investigated, and *how* it should be investigated. There emerged different requirements regarding, say, the confidentiality of material gathered from the trialists, or the occasions when one could legitimately contact them for the purposes of questioning.

Other factors, apart from social considerations prompted continual iteration and revision to the originally proposed research. Chief amongst these was the status of the technological system. The functionality of the system or content material varied over time. This had a direct impact upon user (and partner) perceptions of the system. There were also considerable problems with trialist recruitment.

Taken together, all these events or processes constituted a major influence hindering or demanding change to research proposals. After all, what was one evaluating? If users were only able to view half a film due to technical problems, what was the value, in exploring the usability of the remote control interface? Problems with trialist recruitment were also cited as a result of 'rumours' regarding the impotency of the system to convey meaningful programming.

Coping with these developments, as and when they arose, became a necessary condition of the study. This laid the foundation for a shift in emphasis within the study to include observation of the social and organisational process of the trial. This

expanded view of the trial and its processes included consideration of how user research was negotiated and managed within consortium environments.

General systems theory and holism

With origins widely associated with the biologist Ludwig von Bertalanffy in the 1940s, GST proposes that real systems are open to, and interact with, their environments (i.e. Von Bertalanffy, 1949). They can acquire qualitatively new properties through *emergence*, resulting in continual evolution. GST is described as a series of related definitions, assumptions, and postulates about all levels of systems from atomic particles through atoms, molecules, crystals, viruses, cells, organs, individuals, small groups, societies, planets, solar systems and galaxies (Miller, 1978). It inherently suggests the linking of human, social and non-human entities, micro and macro linkages, local and global effects.

> "Systems are bounded regions in space-time, involving energy interchange between their parts, which are associated in functional relationships and with their environments . . . All behaviour can be conceived of as energy exchange within an open system or from one system to another . . . and that all living systems tend . . . to maintain steady states of many variables . . . in an orderly balance but within a certain range of stability." (Miller, 1956: p.32)

Such thinking proves useful in framing why some social phenomena, institutions and technologies can appear to remain in a steady state for some time, while others dissipate or become unwieldy, unusable, or redundant.

Rather than reducing an entity (e.g. the human body) to the properties of its parts or elements (e.g. organs or cells), GST focuses on the arrangement of and relations between the parts that connect them into a whole. *Holism* refers to a perception of the relatedness of things in approaching reality or a problem. Ramstrom (1974) encourages an increased emphasis on systems thinking to comprehend the increased interdependencies between the system and its environment, and between the various *parts* of the system.

If a conceptualisation may be made regarding a useful network of these interdependencies, one has in fact defined a system (Heylighen, 1992). Scott (1961: p.23) argued that "the only meaningful way to study organisation is to study it as a system" and had observed that the distinctive feature of modern organisation theory was in its conceptualisation of an organisation as an open system. Quade (1975) sees that the systems approach is a way of dealing with complexity in the analysis of the organisation of things. One abstracts from reality and forms an image of the interdependencies that appear to exist among diverse elements. This is distinct from the fragmented or piecemeal approach, such as often marks the pursuit of reductionist science.

A number of fields are closely associated with the systems approach, and of these perhaps most notable are *cybernetics*, *complexity theory* and *chaos*.

Cybernetics, Complexity theory and Chaos

Cybernetics - from the Greek 'kubernetes', which means 'steersmanship' - is a term recently given a new lease of life through its associations with virtual reality and the Internet (e.g. 'cyberspace' as coined by Gibson, 1984). Its origins derive from Wiener (1948/1961) who defined it as; "the science of communication and control in the animal and the machine." In a similar fashion to GST this is a domain that now encompasses many of the traditional disciplines: mathematics, technology, biology but also philosophy and sociology. In GST the study is of the structure of systems and models, however, comprehension of a system cannot be achieved without a constant study of the forces that impinge upon it and this invariably means communication or control in one sense or another (Katz and Kahn, 1966). Cybernetics studies the communication and control in a system and with other systems – i.e. how the systems function.[35] While the ideas and principles of

[35] Aspects that characterise cybernetic systems are:

1. They are very complex, with many interacting components.
2. These components interact in such ways that they create multiple simultaneous interactions among the subsystems.
3. The simultaneous interactions lead to subsystems participating in multiple processes, thus requiring multiple levels of analysis.

cybernetics and systems science are applicable to various phenomena, they are usually applied to the study of complex systems such as organisms, ecologies, societies and machines. These are regarded as multidimensional *networks* of information systems.

Complexity theory and the notion of *self-adaptive systems* are two further closely linked concepts to GST and cybernetics, as is *chaos theory*. Santosus (1998) presents a vivid but simple account of complexity theory:

> "What is complexity theory? One way to understand it is to look skyward to the avian manoeuvrings of birds. A lone bird follows simple rules of behavior, such as when and what to eat. However, a group of birds flying together exhibit complex, unpredictable, creative behaviors that emerge naturally from the interactions of individual birds. For example, a flock in v-formation is able to fly farther and faster than an individual bird. The flock that is formed when autonomous agents - birds - interact is known as a complex adaptive system. To fly in a flock, a bird need follow only three simple rules: Don't bump into anything, keep up and stay in close proximity. Yet following these rules leads to a cohesive, seemingly complicated group of birds flying with the speed and precision of the Blue Angels." (p.6)

Complexity has been described as "at the edge of chaos." (McMaster, 1996: p.13) In this state, patterns can be seen and even understood, but the rich interplay of individual elements cannot be reduced – as they would in GST or cybernetics - to easily identifiable units and relations. They are more like the cluster of birds in flight, patterns can be discerned, with one bird leading, but this is *emergent* rather than agreed by committee, or based purely upon physical prowess or other determining factors. Complexity theory looks at these systems in ways that are organic, non-linear and holistic. In an article that appeared in the *New Scientist* in 1987, Paul Davies speaks of non-linear complex systems:

> "The behaviour of nonlinear systems is enormously rich and diverse. When driven away from equilibrium, they are liable to leap abruptly and

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4. Cybernetic systems usually grow in an opportunistic manner, instead of being designed in an optimal manner.
5. Cybernetic systems increase in size and complexity, developing new traits while still historically bound to previous states.
6. Positive and negative, internal and external feedback is something that cybernetic systems are rich in. The ultimate cybernetic system is one of self-reference, self-modelling, self-production and self-reproduction.

> spontaneously into new, more complex or highly organised states. Alternatively, they may become chaotic. Often there are certain "singular points" where predictability breaks down, the system becoming enormously sensitised to minute fluctuations. It is as if the system had a "free will" to choose between different paths of evolution, to explore new possibilities." (Davies, 1987: p.43)

According to Mitchel Resnick complexity is arising across many phenomena and mental processes partly as a result of *decentralization*:

> "Ideas about decentralization and self-organisation are spreading through the culture like a virus, infecting almost all domains of life. Increasingly, people are choosing decentralized models for the organisations and technologies they construct in the world – and for the theories that they construct about the world." (Resnick, 1994: p.4)

Living systems are non-linear dynamical systems which, although comprising physical material to which all the laws of classical and quantum physics apply, show emergent characteristics like self-organisation. Examples include complex metabolic self-regulation in cellular and organismic structures, and various manifestations of consciousness and cultural emergence. Emergences such as consciousness show well-defined laws of dynamic behaviour when looked at from certain perspectives such as cybernetics and psychology and psychotherapy, but can often appear chaotic to the untrained eye.

The social and the technical

The historian of technology, Thomas Hughes (1987), views that one of the defining aspects of 'system technologies' is that they contain messy, complex, problem-solving components. And a notion of chaos can also be applied to the rich social and physical environments of the home. The networks and infrastructures of electric mains and the plumbing that sustain homes have long raised idiosyncratic problems for builders. In her book *Geography of Home* (1999) Akiko Busch presents a lucid account of the modern habitat and its habitation. Analysing the domestic spaces that compose the modern American home, she offers fascinating insights into the changing conditions and circumstances of our habitats. She outlines how she came to realise the multi-

dimensional contexts and non-linear processes that comprise everyday life and its environments. Many of these dimensions, normally invisible to our consciousness, nevertheless have real impact in smoothing the 'chaos of experience'. Establishing the reasons for an uncharacteristic electricity bill sent her in an unprecedented exploration of the electrical functioning of her home, which in turn led to her 'seeing' her home as; "a network of social and cultural currents, those habits, beliefs, and values that also make it function." (Busch, 1999: p.163) She points to the fact that the most banal, tacit, and familiar activities and phenomena can be highlighted as problems of a complex nature if reframed and brought to conscious awareness in a particular way.

Technical artifacts have many functions which can only find proper explanation in terms of their wider social and symbolic contexts (economic, personal, legal, symbolic, aesthetic, etc.) This is often because they are explicitly designed by engineers to have or manifest these functions and contexts, there is always an argument that this erodes the distinction between technical artefacts and social 'artefacts'.[36]

Social systems

We do not only interact with 'things' but also with each other. This can be directly; for instance, in person 'face-to-face'; or *via* or *mediated* by technology such as phone, semaphore, newspaper, radio, TV, letter and e-mail. Or it may be indirectly *through* technology via the design, operation and public display of features and functions. A well-hackneyed polemic in human and social sciences lies between the primacy of cognitive over social influences, or vice versa, in shaping human affairs. Another polemic is the relation of 'social action' to 'social structure' (Giddens, 1979). Rising

[36] The notion of a function in the wider sense intended here can partly be analysed in terms of the general notion of social function, though admittedly much conceptual work is to be done here. The notion of a social function has been used to put forward explanations for many social phenomena, as part of a research program called functionalism. Functionalists, such as Malinowski (1944) and Merton (1957), held that at least a large class of social phenomena can be explained in terms of their beneficial consequences for society. Since not all of these consequences are intended, Merton has introduced the central idea of 'latent function'. While functionalism has been severely criticised (e.g., by Jon Elster (1994), it has recently regained some of its former popularity. Kincaid (1994) defends functionalism against the penetrating criticism levelled at it by Elster.

beyond the level of neurological phenomena, we not perceive pure forms, unrelated objects, or things as such, rather our 'reaction' to external stimulus relates to the meanings that things have for us (i.e. Neisser, 1976) Toulmin, *et al.* (1984) suggest that:

> " . . . reasoning is less a way of *hitting on new ideas* for that we have to use our imaginations - than it is a way of *testing and sifting ideas critically.* It is concerned with how people share their ideas and thoughts in situations that raise the question of whether those ideas are worth sharing. It is a collective and continuing human transaction." (p.10)

We are aware of, and attach meaning to people, symbols and structures in the world, but as Toulmin sees it "Our ideas are our own, but our concepts are shared".[37] The belief that there is not one objective reality, but various realities that individuals create was the basis of the social-construction-of-reality thesis (Berger & Luckman, 1966). This suggests that meanings are derived from communication with others. It also states that the realities individuals create (and may take for granted) influence their patterns of interaction and emphasises the formation of a relational reality via conversations, actions and reactions, and sequence of events (Von Foerster, 1984; Gergen, 1985).

Interactions also feature as critical events within each individual person's growth and development into the society to which they belong. Civilisation and culture inherently denotes both ways of *seeing* and ways of *doing*. A person's acceptance into a given civilisation and culture often depends upon abilities to conform to social norms, and while in some senses, this acts as a kind of tunnelling or focusing of vision towards what is culturally deemed as important, it can also mark the development of skills that lead to a sense of belonging. Here the precedence is upon social interactions with parents, siblings and others as one grows and develops as an

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[37] Of course even at the neurological level the notion of 'passive receptivity' to things in the world is challenged:

> " . . . the nervous system does not collect information from the environment. It produces a world by specifying what environmental patterns are perturbations, and what change or alterations have caused these perturbations in the organism." (Matura and Verela, 1987: p167)

individual. These interactions shape the person, their behaviours and attitudes, and their worldview.

> "The activities of a domain are enframed by its culture. Their meaning and purpose are socially constructed through negotiations among present and past members. Activities thus cohere in a way that is, in theory, if not always in practice, accessible to members who move within this social framework. These coherent, meaningful, and purposeful activities are *authentic* . . . Authentic activities, then, are most simply defined as the ordinary practices of the culture." (Brown *et al.*, 1989: p.25)

Interactivity in learning is "a necessary and fundamental mechanism for knowledge acquisition and the development of both cognitive and physical skills." (Barker, 1994: p:1). As individuals develop cognitive and motor abilities as children, they have available at any moment a myriad of possible interactions. But as indicated these are constrained and made finite by cultural considerations, individual differences, physical abilities and so forth. The position of phenomenology, symbolic interactionism, and ethnomethodology is upon action and its meaning. I have already suggested that 'interaction' in its essential sense, can be taken as acts of interpretation and reaction that infuse nearly every moment of existence. For instance the field of semiotics dictates that each action, every perception constitutes some act of interaction between the environment of people, objects, nature and symbols (i.e. Eco, 1976; Fiske and Hartley, 1978).

Theories of action and theories of structure have formed a broad debate in the field of social and human sciences (Giddens, 1979). Whereas theories of action tend to be micro-social, focused upon individual's views, theories of structure tend towards the level of organisations at various levels. Theories of structure in sociology derive from the work of Karl Marx, Emile Durkeheim and more recent perspectives derived from structural linguistics. These commentators are more interested with questions of determination, reproduction and power relations. It also raises relevant question regarding the relations of the social self, to the cognitive, inner self. In many respects such processes constitute the subject as a product of their structures. However, the reality is that both these approaches reflexively shape one another in further incidences of co-shaping:

> "Crucial to the idea of structuration, is the theorem of the duality of structure . . . agents and structures are not two independently given sets of phenomena, a dualism, but represent a duality . . . the structural properties of social systems are both medium and outcome of the practices they recursively organise." (Giddens, 1984: p.25)

Herbert Simon for instance describes a scene that truly captures the determining relations of structure and environment. An ant is walking on a beach. Simon notes that the ant's path might be quite complex. But the complexity of the path, says Simon, is not necessarily a reflection of complexity of the ant. Rather it might reflect the complexity of the beach. The point of Simon's scenario is the suggestion that the environment plays an often-underestimated role in influencing and constraining behaviours. Following Simon, Resnick (1994: p.142) suggests that people think of the environment as something to be *acted upon*, not something to be *interacted with.* Here is a defining aspect of environment, structure, or *context* viewed as an *open* rather than *closed* system.

Talcott Parsons (1971) discusses the notion of *social systems*, defined by the interaction of two or more persons in which each actor attempts to account for the action of other actors or in which there are common goals of interaction. This is similar to Rogers (1995) who defines them as "a set of interrelated units that are engaged in joint problem solving to accomplish a common goal." (p. 24) However, within the Cambridge trial, each group, each individual firm on the trial, performed quite distinctive roles, with each often seeking different aims and objectives with respect to their participation.

There were three distinctive social groups, the trial itself made possible through the efforts of two main consortia of companies – one responsible for technology and communications infrastructure –the other for content and services. Members of these groups had a common goal - to test the technology and market for i-Tv. However, the third distinctive social group were the *trialists* – those participants on the trial who were to act out roles as *surrogate* consumer-users- had quite different objectives or goals in being involved with the trial. They wanted to explore the potential of the

new system to deliver entertainment. They were to be central to the resolution of visions. They would provide data and feedback that would first ground the potential of the technology to perform its functional purpose. They would also come to comment upon the viability and value of the system of content and services. Finally they would provide some benchmark of the overall system's business and market potentials – i.e. what people would be willing to pay for, and how much.

More than this, their interest, aims and objectives did not remain static. Rather like the technology that developed and metamorphosed functionally during the trial, interests, aims and objectives were dynamic features. The interplay of these elements, their interaction, co-shaping and co-evaluation, created a chaos and indeterminacy confounding anticipated outcomes. Social systems are definitely not self-maintaining, because they do not directly generate the components which realise themselves (their participants in fact generate the new components) (Hejl, 1984). The applicability of self-maintenance is further complicated by the fact that these components may participate in multiple social systems at any time, and they have the ability to withdraw from participation entirely.

In *Action Systems and Social Systems* (1971) the most distinctive features of Parsons's social theory are illustrated. First, he understands the social system to be a distinct entity, different from but interdependent with three other action systems: culture, personality, and the behavioural organism. Second, Parsons makes explicit reference to Durkheim in his view that social systems are *sui generis* things in which values serve to maintain the patterned integrity of the system. Social systems, unlike technological systems are not always visible beyond observation of the various groups, their interactions and perceptions. These are defined as 'soft' systems as they are to an extent more mutable, and flexible than technology which has been described in terms of being 'hard'.

Another notable contribution to social theory relevant to technology is *Social network analysis*. This focuses on *patterns* of relations among people, organisations, states,

etc. (Berkowitz, 1982; Wellman, 1988; Wasserman & Faust, 1994). Of recent popularity in studies of computer mediated communications (CMC) social network analysts seek to describe networks of relations as fully as possible, tease out the prominent patterns in such networks, trace the flow of information (and other resources) through them, and aim to discover what effects these relations and networks have on people and organisations. It reflects a shift from the individualism common in the social sciences towards a structural analysis. This method suggests a redefinition of the fundamental units of analysis and the development of new analytic methods. The unit is [now] the relation, e.g., kinship relations among persons, communication links among officers of an organisation, friendship structure within a small group. The interesting feature of a relation is its pattern: it has neither age, sex, religion, income, nor attitudes; although these may be attributes of the individuals among whom the relation exists: "A structuralist may ask whether and to what degree friendship is transitive. He [sic] may examine the logical consistency of a set of kin rules, the circularity of hierarchy, or the cliquishness of friendship." (Levine & Mullins, 1978: p. 17)

Researching complexity

Complexity theory in its application in business is viewed as an alternative view to the mechanistic, linear way that typified much organisational and managerial thinking until recently. This is often characterised by simple cause and effect and associated predictable outcomes. Complexity theory applied to organisation suggests that most phenomena and processes in the real world do not reflect such linear thinking. (Wheatly, 1992; Santosus, 1998; McMaster, 1996)

The open systems approach has been chosen to study complexity because it has been commended for its potential usefulness in "synthesizing and analyzing complexity" (Simon, 1969) in "live" organisations. Leavitt, Pinfield and Webb (1974) also recommended an open-systems approach for studying contemporary organisations that would come to exist in a fast-changing and turbulent environment.

Complexity is an area is of great significance to researching phenomena, as it is indeed the area of most information. (McMaster, 1996) One thinks immediately to the occasion of landing in a strange airport, in a country where one does not speak the language. Debilitating at first, one becomes accustomed to the chaos. Patterns are seen to emerge, to become recognisable and familiar, and one is returned to a sense of what Giddens refers to as ontological security. Szent-Gyorgyi (1971) speaks of something similar with respect to the practice and process of research:

> "If I go out into nature, into the unknown, to the fringes of knowledge, everything seems mixed up and contradictory, illogical and incoherent. This is what research does; it smoothes out contradiction and makes things simple, logical and coherent." (pp.1-5)

The implication here is that research provides the necessary medium or lens through which the chaos of natural world can be 'smoothed' in order to show underlying patterns, which can make sense to the investigator, or to other trained and interested 'others' – managers, politicians, regulators, users etc. Patternless chaos is the nemesis of decision-makers, scientists, economists, stock market dealers, policy makers etc. who would wish to reduce and simplify causal effects giving rise to a phenomena, for the purpose of representation and generalisation or the identification of trends. I have already cited a senior manager on the Cambridge Trial who made strong allusions to chaos, complexity and feedback with particular respect to the kinds of new management philosophies and styles of governance that he saw were needed as a result of the new technological potentials. He took the view that what they were creating was a 'infinitely reflexive' style of management and company, not only the apotheosis of total quality management and other customer-centred marketing philosophies, but an entire generation even beyond this:

> " . . . given that the whole process is interactive . . . we're actually building in quality . . . its an inherent process . . . and you don't need to bring it in from outside as a separate process." (Marcus Penny - senior manger for content and services)

Indeed he viewed that such a system is inherently non-linear, and one of the problems that he was wrestling with, was the expectation, particularly in the process of management, that issues could be reduced to a linear process. When this was not

deemed possible, it seems a problem. Not just applicable to the Cambridge Trial he viewed this as an industry-wide perspective - that there is a linear management process at the core, and everything else is chaos. Indeed, Westrum (1991) has pointed out that:

> "What is not understood cannot be controlled. If we do not unpack the way in which technology is shaped by society, we cannot change the shaping . . . before we can expand the area of intelligent human choice, we must understand how technology and society interact." (p.79)

Rycroft and Kash (1999) assert that leaders of both companies and countries are: "continuously in search of new concepts, rules, and models that will be useful in dealing with ever-changing reality." (p.17) Indeed Shackle (1963: p.13) argues that the entire field of economics resulted from: " . . .the study of how men seek to cope with two of the great basic, inescapable conditions of life: scarcity or lack of means; and uncertainty or lack of knowledge."

Providing scope to understand, contain, control and channel complexity represents the endeavour, and challenge, of recent social scientific theories aimed at distinguishing the products of, and influences upon, social and technological action.

Techniques of understanding and mapping sociotechnical systems

An immediate question arises concerning how best to map relations within an overall system that comprises social and technical elements. Both can manifest considerable levels of complexity within themselves, let alone considered together as a 'meshed' whole. Influenced directly or indirectly by GST and complementary theories such as cybernetics, the second half of the last century has witnessed a number of attempts which aim to chart and illustrating the way in which cognitive, social and physical elements interact in processes of technical innovation and development.

In addition to GST, some of these approaches owe a legacy to the notion of 'scientific management' (Taylor, 1911) or even Weber (1947) when he refers to the 'bureaucratic phenomena'. While these ideas came to carry negative associations, they

inspired mechanistic models of the organisation. Kling (1987) considers that the trend in mechanistic models of technological systems, while often justifying economic, physical and information processing aspects of developments, often ignored the context of complex social actions in which technologies are developed and deployed. Many information systems professionals, for instance, are still locked into a mechanistic viewpoint of organisations that tends to neglect the socio-political and socio-cultural elements of information systems.

Wheatly (1992) asserts that: "Many management strategy theorists either were engineers, or admired that profession . . . There has been a close connection . . . between their scientific training and their attempts to create a systematic, rational approach to business strategy." (p.27) Systemic views of organisation (such as suggested by Simon, 1996) have suggested that functions can be broken down into component parts for the purpose of analysis. But recent frameworks coming from academia move in quite a different direction. Actor-network theory goes so far as to deliberately blur the distinction between human and technical components contributing to a system and its development and use.

What many of these frameworks have in common is a description of the space or environment where the social or the psychological encounters the technical. This space or environment has been called variously the 'system', 'network', 'constituency', 'web' or 'matrix' amongst other terms. Each conveys a strong sense of connection and interrelatedness between various elements, and so bear direct relation to the core aims of GST. This interrelatedness may manifest in hardware terms (as in a cable communications network), or in terms of software (such as the flows of electrons in a public transport system). It may also manifest in the passage of more symbolic collateral such as information and knowledge exchanges and flows that come to inform and shape the perceptions of multiple interest groups.

Approaches, frameworks, tools

Some frameworks are aimed towards practitioners – i.e. studies of a 'managerially

relevant' or policy-making nature, or cognitive tools for use within industrial settings and projects. Other approaches are of a more academic nature, aimed at providing frameworks of analysis for academic reporting. While there is a similar tension between the notion of 'tool' and 'framework', as what exists between 'practice' and 'theory', in certain cases, industrial and academic approaches are not mutually exclusive.[38]

Many of the industrial 'tools' have roots in public and private research projects. For instance, the *sociotechnical approach* - used to optimise organisation - arose from research conducted at the Tavistock Institute (the first work was an investigation in British coalmines by Trist and Bamforth, 1951). Another stream of research into information systems was inspired by *contingency theory*, as introduced by Woodward (1965), and which has come to inspire the majority of the earlier literature on identifying user requirements (e.g. Ives *et al.*, 1983; Bailey & Pearson, 1983; Davis & Olson, 1984; Baroudi *et al.*1986). This work explores the relationship between organisational structures and technical systems. She revealed that organisational effectiveness was the consequence of a match between a situation and a structure – part and whole.

There are also tools aimed at optimising technology with respect to addressing consumer-user *needs and requirements*. This group includes *Quality Function Deployment* (QFD), developed in the 1960s out of work conducted by Japanese academics into research and development, design and manufacturing processes.[39] It is also worth noting that *ergonomic* and *usability* testing of products also emerge from

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[38] *Praxis*, a term used by Aristotle, is the art of acting upon the conditions one faces in order to change them. It deals with the disciplines and activities predominant in the ethical and political lives of people. Aristotle contrasted this with *Theoria* – those sciences and activities that are concerned with knowing for its own sake. Both are equally needed he thought. That knowledge is derived from practice, and practice informed by knowledge, in an ongoing process, is a cornerstone of action research.

[39] Most notably Professors Shigeru Mizuno and Yoji Akao. Their purpose was to develop a quality assurance method that would design customer satisfaction into a product before it was manufactured. The first large scale application was presented by Kiyotaka Oshiumi of Bridgestone Tire, which used a process assurance items fishbone diagram to identify each customer requirement (effect) and to identify the design substitute quality characteristics and process factors (causes) needed to control and measure it. Earlier quality control methods were primarily aimed at fixing a problem during or after

the fields of physiological research, experimental psychology and cognitive and computer science.

A more scholarly and sociological style of analysis can be seen in the work arising from Science and Technology Studies (STS) school. Chief amongst this group are perhaps the 'social shaping' (i.e. MacKenzie & Wajcman, 1985) or 'social constructivist' (i.e. Bijker & Law, 1992) perspectives. These seek to explicate the relation of technology to society, and have presented this as a dynamic two-way process of co-evolution and co-influence. The constructivist way of approaching the analysis of technology development and the processes of innovation show how they may be interpreted as matters of wider social explanation, in every way as relevant to the success or failure of projects as purely physical and functional matters.

Coming from the field of cultural studies field Johnson (1986) viewed the diffusion of technologies as a process of semiotics, meaning-making and representation. Others, such as Du Gay *et al.* (1996), have elaborated on this work establishing a notion of a 'cultural circuit'. This is viewed as perpetuating the development of, and subsequent diffusion of, both ideas and actual products between various institutions and actors.[40]

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manufacturing.

[40] However the du Gay *et al.* model is a social and culturally-based perspective of products and their diffusion. It neglects somewhat the concept of individual and pragmatic instances of use. In this formulation use is somehow sublimated into the concept of consumption. Nevertheless, the elements, institutions and forces which comprise the model, each plays a distinctive role in shaping one another and driving what is has been termed as either 'evolution' or 'revolution' in technology and business practice, and ultimately culture and the wider society.

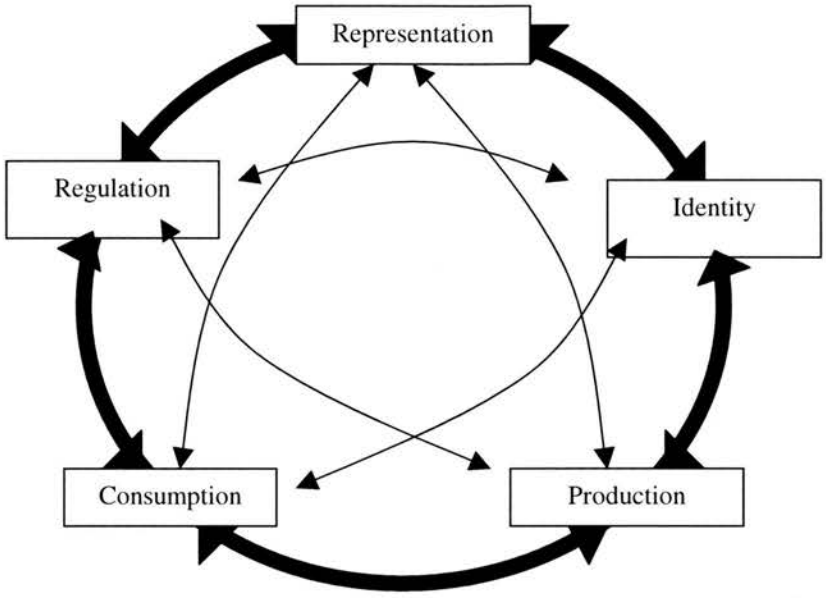

Fig. 2.1 Du Gay et al's 'circuit of culture (after du Gay *et al.*, 1997)

Clifford Geertz's (1973: p.5) definition of culture as "webs of significance sown by man," suggests the cultural circuit as the conduit between discourse and knowledge of a product and technology. Grant McCracken also subscribes to a 'current' of meaning which is " . . . constantly flowing to and from several locations in the social world, aided by the collective and individual efforts of designers, producers, advertisers and consumers." (p.71) They convey a very live, dynamic process where 'meaning' is constantly circulating, picking-up, laying the foundations for, and developing new forms of interpretation and re-interpretation. Such processes can operate on micro (i.e. small group) as well as macro (i.e. societal, cultural) levels.

Bijker (1995) draws attention to the design specifications of fluorescent lights catering to the needs of different interest groups rather than for performance or economy. The 'dominant' design was a product of the *Nela Park Conference* - where representatives of Mazda met with representatives of the electricity utilities - two highly prominent relevant social groups. Bijker suggests that the now familiar lamp was indeed *designed by the managers* around the conference table, rather than by

engineers and designers in a workshop:

> "At that meeting a third fluorescent lamp was designed - not on the drawing board or the laboratory bench, but at the conference table." (p.238)

Design as a subject of analysis is at its most rich viewed as the *interaction* between the various elements – social, individual and technical - at different periods in development (or even depending on where the researcher casts, *or is given permission to* - cast, their gaze). Pinch and Bijker acknowledge this in their notion of *sociotechnical ensembles*. While maintaining a distinct prejudice for the social dimensions in their accounts this acknowledges the notion that social and technical elements constrain and shape each other in the processes of development.

These approaches emphasise a contextualist approach that attempts to show; "the internal design of specific technologies as dynamically interacting with a complex of economic, political, and cultural factors." (Staudenmaier, 1985: p. 11) Current trends in the history of technology tend to favour contextualist history. Such approaches emphasise the particularities of the social and historical conditions in which different technologies have developed. In so doing, they have avoided the excessively deterministic implications of so many histories which focus on the technology as an intrinsic phenomenon in itself. Contextualist history builds on an earlier consciousness of technical differences as illustrated in more traditional historical accounts, but also reflects a concomitant awareness of how social factors influence design and development.

Perhaps the most notable approaches in the category of more academically orientated work includes *actor-network theory* - ANT (i.e. Callon, 1980, 1986; Bijker and Law, 1992; Latour, 1987, 1996) and *sociotechnical constituencies* (i.e. Molina, 1989, 1990). These approaches represent genuine attempts to straddle the realms of the technological and the social for the purpose of creating more holistic attitudes within the area of strategy or policy making.

Actor-network theory

ANT is most prominently associated with the French sociologists of science Bruno Latour and Michel Callon. It represents an attempt to describe how heterogeneous human and non-human, social and material entities are related to one another within networks, built and maintained in order to achieve a particular goal, for example the development of a product. Its most radical stance is that it privileges neither humans nor non-humans in its analysis, as both are viewed as equal actors. Beyond a kind of anthropomorphism with respect to physical objects, such a view has been adopted by a number of commentators, serving as a useful reconceptualisation of the relations between people and 'things'. Igor Kopytoff (1986) for instance, has drawn attention to the 'biography of the thing'. In this he suggests that an object, artefact, or technology, much like an individual human being, can possess a biography. Throughout their 'lives' there is change and transformation, and through these they "can reveal the changing qualities of the shaping environments through which they pass" (Silverstone *et al.*, 1992: p.17). Stewart Brand's (1994) *How Buildings Learn* is another excellent example of a semantic switch between the primacy of human affairs over that of 'things'. He suggests that the transformations of buildings over time and the changes that successive occupants make represent a building's 'learning'. Such animist perspectives can highlight previously tacit, unseen relationships which are nevertheless important for understanding and evaluating human relationships to the built environment, and the objects, messages and symbols that populate it.

The view of actor-networks has it that social, physical, cognitive and economic elements fuse in a 'seamless web' where human action is constrained as much by technological functions as social elements such as the rules and regulations which may govern use. On analysis this approach owes much to systems theory, as another of its distinguishing aspects is its stress upon the complete dependency of one 'actor' on every other 'actor' in the network to maintain cohesion. Each part of the network is at the same time representing several different smaller parts of a whole, while being minimised into a small part of an even larger whole.

This is hardly a new idea as it relates to GST and to what Herbert Simon (1996) suggested when he spoke of the 'sciences of the artificial'. This describes objects and phenomena – artefacts – that result from human intervention in the natural world. Material artefacts, the knowledge to build and use them, as well as the outcomes of their operation and use – this means climate controlled air, through to cars and the laws that governs their operation - are each examples of such intervention. Each is equally as worthy as any other part in being considered in the operation and integrity of an overall system.[41]

This is a very similar notion to another ANT theme – that of 'hybrids', or 'quasi-objects', which can be simultaneously real, social, and discursive - ANT highlights the significance of each of these in its analysis (see, e.g. Latour 1993: p.91). The key term actor, for example, is not used as in conventional sociology where actors are usually defined as "discrete individual, corporate, or collective social units" (Wasserman, 1985: p.17). Rather actors' identities and qualities are defined during negotiations between representatives of human and non-human 'actants'. In this perspective, *representation* is understood in its political dimension, as a process of delegation. The most important of these negotiations is 'translation' - a multifaceted interaction in which actors:

- Construct common definitions and meanings:
- Define representativities, and:
- Co-opt each other in the pursuit of individual and collective objectives.

In the actor-networks, both actors and actants share the scene in the reconstruction of the network of interactions leading to the stabilisation of the system. But the crucial difference between them is that only actors are able to put actants – the non-human elements - in circulation in the system, such as when a local government decides to implement a new means of public transport. The development of actor- networks is a

[41] As Norman (1993) says, "Without someone to interpret them, cognitive artifacts have no function. That means that if they are to work properly, they must be designed with consideration of the workings of human cognition." The *distributed cognition approach* (i.e. Hutchins, 1995) is concerned with a wide spectrum of cognitive phenomena; from analysing the properties of processes of a system of actors interacting with each other and an array of technological artefacts to perform some activity (e.g. flying a plane) to analysing the properties and processes of a brain activity (e.g. perceiving depth).

concatenation of translations - effort by actors in the network to move other actors to other positions, thereby translating these actors as well (i.e. the local government bringing in engineers to implement the work). This concept of translation is the crux of the ANT approach.

In essence, networks allow actors to translate their objectives, be they conscious human choice or prescription of an object, into other actors and adding the other actors' power to their own. "By translation we understand all the negotiations, intrigues, calculations, acts of persuasion and violence thanks to which an actor or force takes, or causes to be conferred to itself, authority to speak or act on behalf of another actor or force." (Callon and Latour, 1981: p.279) Networks emerge and are shaped by aligning more and more actors. In this way an actor can grow. The importance of an actor depends therefore on the number of other actors within his/her/its networks which he/she/it can employ to a particular purpose.

The size and shape of actor-networks is not *a priori* but the result of a long development. There is no fundamental difference between a large structure and a small structure; the only difference is in the number of actors that can be employed. It is a mistake to take differences in size of a network for differences in level, because networks always connect at the same time what conventional sociology differentiates into micro and macro levels. This interconnection renders such a distinction less significant, because "that which is large is that which has successfully translated others and has therefore grown. Since size is nothing more than the end-product of translation, the need for two analytical vocabularies is thus avoided." (Callon, Law, Rip, 1986: p.228)

Networks are made up of network-actors that are always localised yet these networks can extend around the globe. Networks can be so large and stable that they appear to be independent from the actors (such as technical standards). This, however, is a misconception. While they can (and do) seriously constrain the range of action for certain actors, they always need actors. Any given actor might be replaceable, but

only by another actor. There is, therefore, no gap between the individual and the structure which is made up of individuals which are made up of structure which is made up of individuals and so on, endlessly. For Bruno Latour (1993; p.122); " . . .the two extremes, local and global, are much less interesting than the intermediary arrangements that we are calling networks."

The construction of a common sense of purpose, utility, and benefit of a system or artefact is one aspect of the sociotechnical negotiation. Pinch and Bijker (1989: p.28; and Orlikowski, 1992: p.403), discuss the *interpretive flexibility* of artefacts. All artefacts are open to various readings over their development. Social groups with various interests and resources attach meanings to artefacts. These groups shape and reshape artefacts through the construction of problems posed and solutions offered by those artefacts. Eventually both artefact and meaning are stabilised through social negotiation. Once developed, technological systems and artefacts become reified and institutionalised, and lose the connections with human agents that gave them meaning and sense (Orlikowski, 1992: p. 404). The notion of interpretive flexibility brings social constructivist views of technology closer to media, cultural and consumer studies. At this time were also coming to studying less what media 'does to people' but more how consumers/people *actively* appropriate, and thereby change, products and services through their kinds of integration in daily life and routines (Silverstone and Hirsch, 1992, Morley, 1992, MacKay and Gillespie, 1992).

But one of the failings of ANT, and other constructivist approaches, perhaps lies with the fact that its openness as a system of analysis suggests no real way of mapping or showing the weight of nodes within the network. What one is left with is rather a 'fog' of images and perceptions regarding a technology, because what is meaning from an analysis founded on semiotics is that motivations and other inertias to technology development are relegated in favour of outcomes or effects.

> "Actor network theory is a ruthless application of semiotics. It tells that entities take their form and acquire their attributes as a result of their relations with other entities. In this scheme of things entities have no inherent qualities: essentialist divisions are thrown on the bonfire of the dualisms. Truth and falsehood. Large and small. Agency and structure. Human and non-human.

> Before and after. Knowledge and power. Context and content. Materiality and sociality. Activity and passivity. In one way or another all of these divides have been rubbished . . . it is not, in this semiotic world-view, that there **are** no divisions. It is rather that such divisions or distinctions are understood as **effects** or **outcomes**. They are not given in the order of things." (Law, 1997, emphasis in original)[42]

In a sense they follow Ricoeur, (1971) when he writes that there may be a;

> " . . . specific pluriocity belonging to the meaning of human action . . . human action too, is a limited field of possible contradictions . . . It is always possible to argue for or against an interpretation, to confront interpretations, to arbitrate between them and to seek for an agreement, even if this agreement remains beyond our reach. In the final analysis differences in interpretation can only be arbitrated by applying socially accepted modes of justification; i.e., what will count as a convincing argument." (p.331)

One set of questions that remains vague in the ANT is how to limit the analysis; where does one network end and the next one begin? The question of boundaries to contextual studies is cited by Morley (1992: p.187) when he considers the pragmatic aspect of ethnographic studies of television viewing contexts. " . . .which elements of the (potentially infinite) realm of 'context' is going to be relevant to the particular research at hand." The opposite is in a sense also true for actor-networks. In effect is the network which comes to be realised a 'fair' representation? Bijker and Law are not absolutely convinced; "in effect it (actor-networks) rests on a bet that for certain purposes some phenomena are more important than others. It simplifies down to what it takes to be essential." (1992: p.7)

Sociotechnical constituencies

Sociotechnical constituencies (Molina, 1989, 1990, 1993, 1994, 1995), as a theory and framework, shares much with ANT and the other social constructivist analyses of social and technical relations. But, unlike ANT, it strives to distinguish and delineate social and technical elements. Molina, following other critics of actor-network theory (Clark *et al.*, 1988) argue that this methodological stance dissolves the understanding of technology which most people employ in assessing its importance on work and

[42] http://tina.lancs.ac.uk/sociology/stslaw3.html

organisations. To do this is to render it nonsensical.

Constituencies take the brave step of structuring and pre-figuring contexts. It recognises that at a macro level social institutions may evolve at a slower pace than technology development - an institution understood as a persistent structure of human relationships (e.g., Powell and DiMaggio 1991), but alliances, partnerships and deals can be easily broken in a single meeting with severe consequences to a business. Technologies on the other hand always exert certain continuities of path-dependencies. He sees the mitigation of distinction of the technological as a hindrance to advancing social studies of technology towards any aim of informing strategy and policy decisions.

Molina's (1995: p.23) defines sociotechnical constituencies as:

> " . . . dynamic ensembles of technical constituents (tools, machines etc.) and social constituents (people and their values, interest groups, etc.) which interact and shape each other in the course of the creation, production and diffusion (including implementation) of specific technologies."

Constituencies are built by particular social actors – *constituency builders* – champions who manifest particular traits and behaviours and who wish to directly exploit and develop the particular features and unique value propositions of certain technologies.

Overall, constituencies provides a comparatively more systemic approach to understanding how the various elements comprising the constituency of social and technical elements can interrelate. The main benefit of this approach, over actor-networks are that the common areas of 'constituency' (or network or system) analysis are pre-figured. This helps target and focus research activity according to particular purposes, and most importantly *across cases*.

The formulation of typologies is a familiar activity in social science research. A more formal definition is that a typology partitions events into types that share specified combinations of factors. (Stinchcombe, 1968: pp.43-45) The power of typological

theories and systems is that they comprise a number of contingent generalisations, allowing the researcher to move across cases with ease and make realistic comparisons. Classification systems operate very many like typological theories. Kwasnik (1992) states that:

> "Classifications are really very much like theories. Like theories, classification schemes can provide an explanatory shell for looking at the world from a contextually determined perspective. Classification schemes not only reflect knowledge by being based on theory and displaying it in a useful way...but also classifications in themselves function as theories do and serve a similar role in inquiry." (p. 63)

However, the main shortcoming of this approach is one it shares with many research approaches and frameworks that offer prescriptive classification typology systems. Classifications have structural properties that lend themselves to representing knowledge in a given format or pre-ordained way. As such they may act to mitigate observance or proper identification of anomalies or phenomena that defy 'pigeon-holing' style of classification of socially defined forces. Bennet and George (1997) see that in the early stages of reflection and research on a complex problem, the investigator will be reluctant to begin comparative study by attempting to build a research design and select cases based on a full, logically complete typology, such as that suggested by sociotechnical constituencies. The use of case studies for the development of typological theories, and the use of these theories in turn to design case study research and select cases, are iterative processes that involve both inductive study and deductive theorising.

An *a priori*, "logical" approach to typologising outcomes of efforts to achieve deterrence is likely to settle for a simple distinction between 'success' and 'failure'. But such approaches may nevertheless be important, defining, unique or even crucial, features of socio-technical processes. Opposed to actor-networks, which tend to be internalist approaches to studying socio-technical phenomena, sociotechnical constituencies is a externalist, often contextualist framework which is constantly identifying a particular element of actors place within an industrial, or even national-level perspective. It can be handled at the outset of the research in a more open-ended

way, allowing the development of a typology and associated theory. That is, new cases that are studied may lead to identification of new types of 'success' or 'failure' viewed from the goals of the various actors involved (in the Cambridge case mangers, designers and trialists).

Constituencies theory attempts to express the multitude of forces which cumulate in the success or failure of a product vision throughout its production, and to a lesser extent, its diffusion. It is an attempt to illustrate the way in which it expresses the dynamic in which both social and technical constituents combine and mesh to shape each other in the process of creating, producing, and diffusing specific products and services.

Technical constituents of technological systems such as the Cambridge Interactive Television Trial, rely strongly on technologies that are themselves the products of other sociotechnical constituencies. PCs for instance are ensembles of technologies (microprocessors, motherboard, RAM, hard drive etc.) often produced by different manufacturers, which, on being compatible and obeying standards, work in concert to produce a working machine. An overview of a very generalised constituency is shown below.

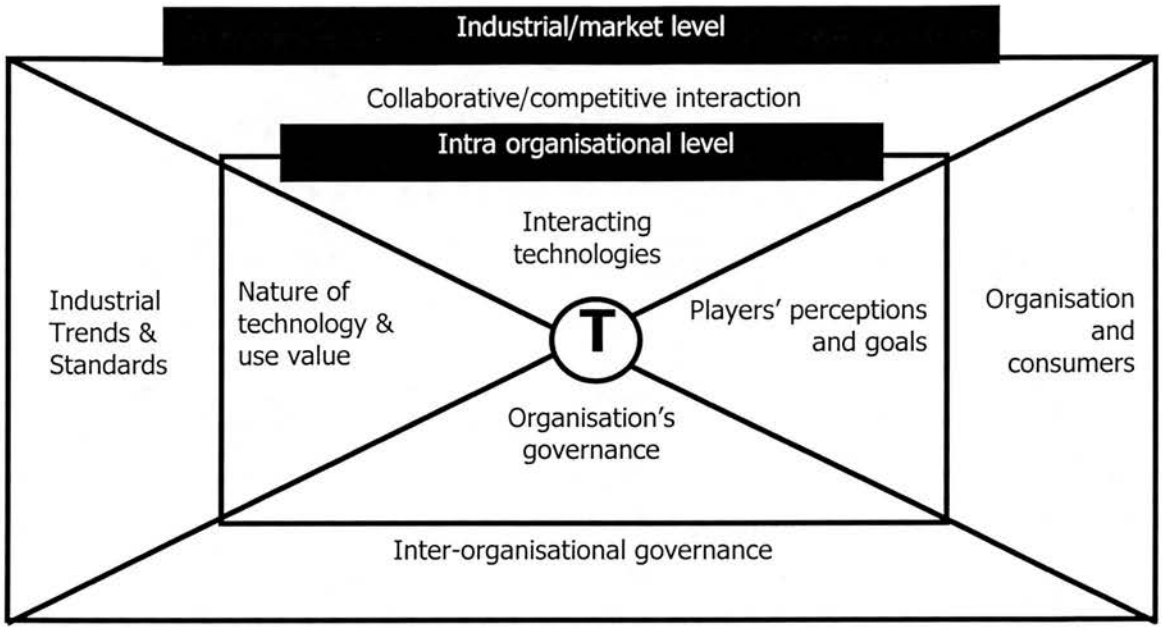

Fig. 2.2 Sociotechnical constituency with technology at the centre (after Molina, 1989)

The individual components in the above diagram each play key roles in defining and shaping a technology ('T' in the centre) from its inception (i.e. industrial trends and standards, market and consumer trends), through its development and production (drawing more upon more immediate influences – i.e. the organisation's governance, availability of 'off-the-shelf' components and so on).

As mentioned earlier technical components are often developed on an individual basis by multiple producers which have themselves evolved through the development of their own constituencies - not least the social construction of standards which ensure their fit with other PC components. This suggests the *generative* aspects of constituencies, which truly defines them as different in structure from networks or even systems, which suggest fixed, identifiable nodes and relations. It recognises the socio-historical forces shaping technological development and innovation, and this takes precedence over issues and identification of instances of translation. It accepts *prima facie* the existence and influence of pre-existing sociotechnical structures in defining and inspiring the new. It also recognises that there is a dynamic shifting in the influence of each of the elements over time, due largely to the waxing and waning of the various 'sub' constituencies which contribute to the constituency under analysis

(for instance the constituency of interactive television set top box technology may be dramatically influenced by a change in either video card technology, or in regulatory policy or by a take-over of the company). A useful analogy may be to compare constituencies to wave theory as opposed to the more rigid network structures characteristic of ANT.

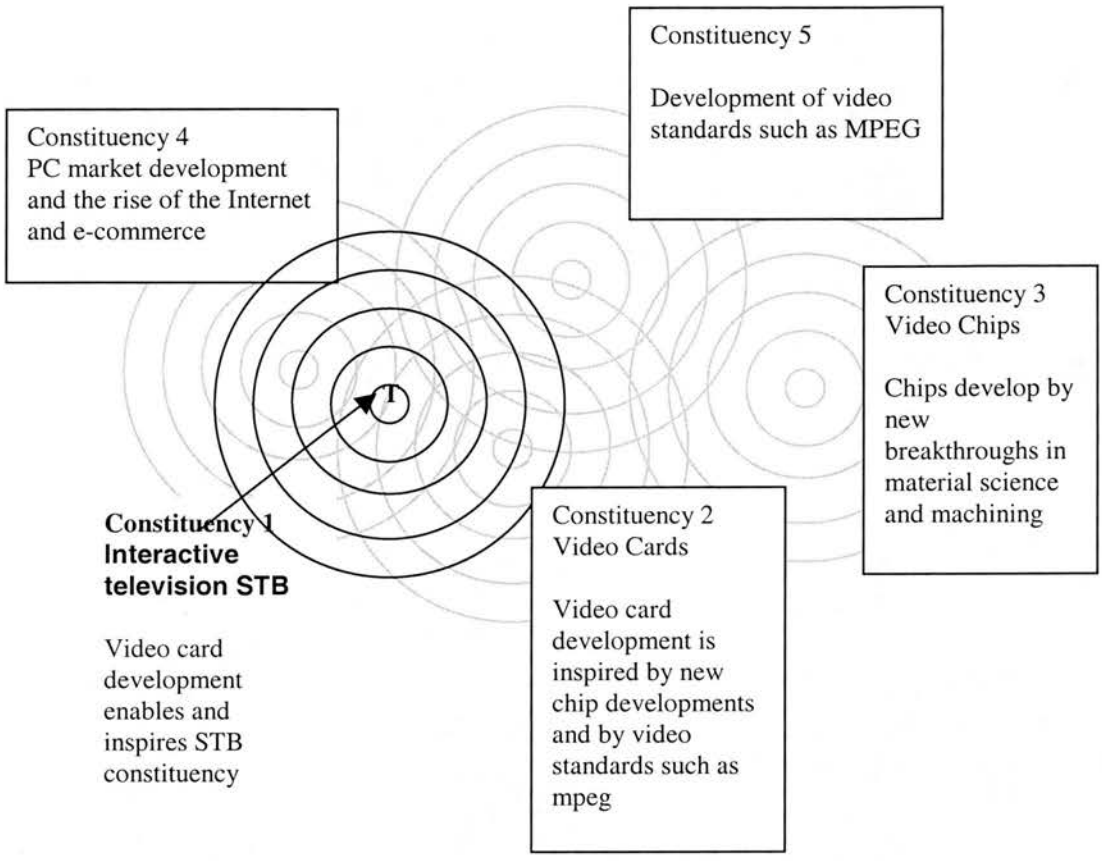

Fig 2.3 Meshing of constituencies as they develop, creating 'ripples' of cause and effects, inspiration and shaping.

By considering the temporal element in the biography of a technology's development one can map how particular elements comprising the constituency waxes and wanes in influence. Rather than proceeding as if individual perceptions and actions can be held constant for the purpose of analysis or that individuals are motivated by a single goal (e.g., profit maximization), analysis focuses upon how and why perceptions and action are continuously changing through time and space.

Molina (1997; p.2) suggests that in ANT, the juncture where the social encounters the technical; "needs to be discovered every time as results of the perceptions and opinions of other actors." Actor-networks then deny the possibility of any inputed characteristics being applied to either social or technical actors or actants – the non-human elements - for the purposes of analysis.

Indeed, if one considers the claims of chapter one - that we are not surrounded by an infinite variety of media technologies, but really a delimited number of variations which exhibit certain common features and functions – to start from scratch in investigating their function and how it comes to be encountered as a phenomena, seems a very long winded approach to studying technology. Beyond wide screen, stereo sound, teletext and colour, the television-as-technology has changed little over the years in terms of basic function from the user perspective.

This is an important aspect in Molina's sociotechnical model. Technologies, especially complex technologies, do maintain certain stability, or at least some generic elements by which they may be differentiated according to how they may function and perform. This also to a large extent dictates how they will 'fit' with perceived and anticipated use. For instance they must be robust enough to handle their perceived day-to-day use and usage. A critical issue with the Om STB and remote control technology was that it be robust for the mass market.[43] There was also found to be a lack of 'fit' between remote control functioning and some of the content elements. The button layout and ergonomics worked fine for VoD use, but were unwieldy and practically unusable for games use.

For Molina, the observable network, that is, the architecture of relations at each moment in time, contains an expectation of its future operation. This is often lost in ANT style studies, and so there is an argument that sociotechnical constituencies

[43] On one 'long haul' trip to New Zealand, Om had to send a technical specialist accompanying the sale staff equipped with a demonstrator prototype STB. This was early in the trial when technical staff were at a premium and largely indispensable. But he was viewed as insurance against any breakdown, and indeed, on arrival there was indeed a serious problem that required the engineer's expertise to fix before the sales team were able to successfully show the prototype.

theory offers an extended and more systematised account of the way in which actors' perceptions and visions meld as social and technical elements combine. There is also criticism of the notion of 'actants' [the non-human 'actors'] in ANT. Molina sees them as only realised as the result of the perception and opinions of other [human] actors, and not truly valid as having some king of equivocal status to that of sentient human beings. He also sees this as a reductionism or marginalisation of the role of the technical in the network, as it is reduced to the level of a 'black box'.[44] This classification does not extend however beyond networks because;

> " . . . people (who constitute networks) are different, then we are constantly back to square one with every new process of technology development confronting the analyst. In short, a recipe for blindness regarding 'the technical terrain' and for irrelevance regarding this particular dimension of technology strategy." (Molina, 1997: p.4)

If one considers Fleck (1988) it becomes clearer exactly what Molina is suggesting here. Fleck defines four generic forms that are consistent with different theories of innovation and technology. These are *discrete technologies*, *component technologies, generic system technologies*, and *configurational technologies*. Discrete technologies function as self-contained packages and require no further interfacing with other elements to make them functionally relevant. A mature and simple technology such as a tin opener performs a straightforward function that needs little in the way of user-led innovation. Its use can be easily pre-figured and anticipated. Component technologies function as part of a relatively stable system, and as such, the system characteristics and requirements guide and help denote aspects and specifications.

Generic system technologies refer to "complexes of elements or component

[44] The term 'black box' is interesting in the context of this chapter. The term is used in electronics to describe a unit "whose circuitry need not be known to understand its function." (source: Collins dictionary). In the computer industry it refers to a device designed by another company for general industry use, for example an audio card. Metaphorically, it is used for a specific kind of abstraction, where none of the internal workings of something are visible, and that one can only observe output as reaction to some specific input. It also hints that the workings of the box are not of research interest, either being already well understood and proven, or perhaps, not considered at all necessary or of consequence to understand.

technologies which condition or constrain one another, so that the whole complex works together." The main difference here is that changes to specific component parts may lead to requiring change in the overall system. And *configurational technologies* are more mutable kinds of systems, in an early stage of evolution, which will be more fully developed and defined through their situating in intended working environments. The agency of users can be viewed relative to the stabilisation and standardisation of the system and its components (which is largely the position of sociotechnical constituencies).

In summary, sociotechnical constituencies approach offers a framework which has as its focus the fact that technologies come into the picture of development with legacy. This is in terms of its functional characteristics, as well as more macro level attributes such as their adherence to standards etc. Social elements wishing to converge upon the technologies must do so in adherence to these legacy aspects, and so there is a primacy or biased weighting afforded to technology over, the other more fluid 'softer' parts of the development process. This is where it differs from ANT, which prefers to visit anew the process of development and makes a conscious effort to not privilege one part of a system over another.

The constituencies of the Cambridge Trial

The case outlined later also goes some way to illustrate the 'parts off the shelf' nature of the set top box, with parts and people (expertise) drawn from previous and on-going projects put together to form a singular new product. Also, the consortium of companies which came together to form the technology partners, also suggested the rationalised interdependence of people and technology who were invited to take part in the Cambridge Trial. One of these partners - a cable company – represented not only a communications infrastructure but also a significant subscriber base.

Constituencies do not occur within, or arise form, a vacuum, nor do they emerge merely the result of industry trends, but rather through the work and agency of *constituency builders*. These are institutions or individuals who draw together the

partners and elements necessary for technical developments. Om were the constituency builder of the Cambridge Trial. And within the trial itself came two constituencies. One addressed technology, whilst another addressed the development of content and services. There roles were critical in that they consolidated and negotiated between partners in what was essentially two concurrent constituencies, each of whom were often chasing or desiring very different outcomes and goals. Constituency builders are similar to the more familiar roles of product or project champions that appear in the management literature, except that their main focus tends to be on the creation and propagation of wider networks of technical and social elements. In other words, they generate content and context for social and technical change. When constituencies confront and combine, the nodes illustrate spaces of possibility and tension between the differing constituencies. In the case study this may be where the original demonstration box (created within the constituency generated by Om's managing director Dave Swallow, who may be considered as the overall constituency builder for the technology) influenced and drove the content and services visions of Marcus Penny (senior manager responsible for content and services).[45] However, later technical orientations of the box towards CD-ROM driven devices and so on, created a tension between the two constituencies in Om. It was indicative of the split between economic realties, market conditions, technological development, and the innovations of services and content.

Constituencies as complex and dynamic entities emphasise "interrelation and interaction" between the various elements motivating and creating the conditions for technological development. They are constantly evolving and changing networks of interrelated elements or nodes, some of which can dominate at times, remain constant, be sublimated against other elements or indeed drop out completely. One may consider or stress either the social or technical contingencies in an analysis of technological development whilst maintaining the understanding that it is both, in

[45] It would be important to stress here that Om, an operating arm of Acorn Computers, was primarily a technology company. Content and services were viewed as an integral part of the technical proposition of a set top box, and to an extent and inevitable part of the ability to illustrate its value. But Acorn had already seen the value of selling software for its BBC computer, and realised the potentials which lay in the selling of software. However, as the case illustrates later providing content for interactive

concert at every given moment, that provide an index of the growth or decline of a product and project. As social and human elements in a constituency are dynamic and always changing, likewise technical elements evolve from their inception as discrete developments to mature and stabilised products, but today more so than ever, products and services must constantly be innovated in order for companies to remain on top within their market sector.[46] This dynamism is what guides and gives the constituency its shape and direction. Similarly systems, as more 'macro' versions of individual products go through similar evolutionary phases. They too often have a chaotic inception (arguments, dis-aligned views etc.) that eventually converges to stabilise. However, this stabilisation is a correlate of the alignment and adherence to standards and co-operation between system components and the firms that make them. Also a system may be comprised of constituent parts, some of which may evolve faster than others, leading to a destabilisation within the constituency. This is where the ambitions and objectives of the companies making these parts suggest a shadowing of the advantages of remaining part of the system sustaining the consortium and developing their technological contribution. This is the underlying principal that fuels many of the new media, so-called 'converging alliances'.

Chapter discussion

It was only very recently that researchers have come to explore the broader range of cultural practices associated with the design and use of computing in the workplace (i.e. Star, 1995). Systems thinking is becoming more pervasive generally in the way in which people design and consider technologies and services, and other kinds of structural processes. Such analysis must not only consider analysis at the social and technical level, but also indeed include *outcomes* or *experience*, as an integral aspect of development (in a similar vein to the distributed cognition approach of Hutchins, 1995). This includes the usability of services, of fulfilment, the 'ergonomics' of the social and organisational fulfilment. Computers are no longer aimed at being

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television represented its own unique and in the end, insurmountable challenges.

46 Amongst the reasons for this is what Drucker (1959: p.23) drew attention to almost 40 years ago; "The only protection against the risk of exposure to innovation is to innovate. We can defend ourselves against the constant threat of being overtaken by innovation only by taking the offensive."

surrogates for human tasks. When they are used to deliver a service, for communication, for entertainment the focus shifts to the notion of quality and utility at the individual and group level. Quality of service cannot be captured by technical function. It includes a wide range of social roles and provision – both in front of the screen, and beyond it through the technical and social networks of users, service providers, and suppliers/distributors etc.) (see below).

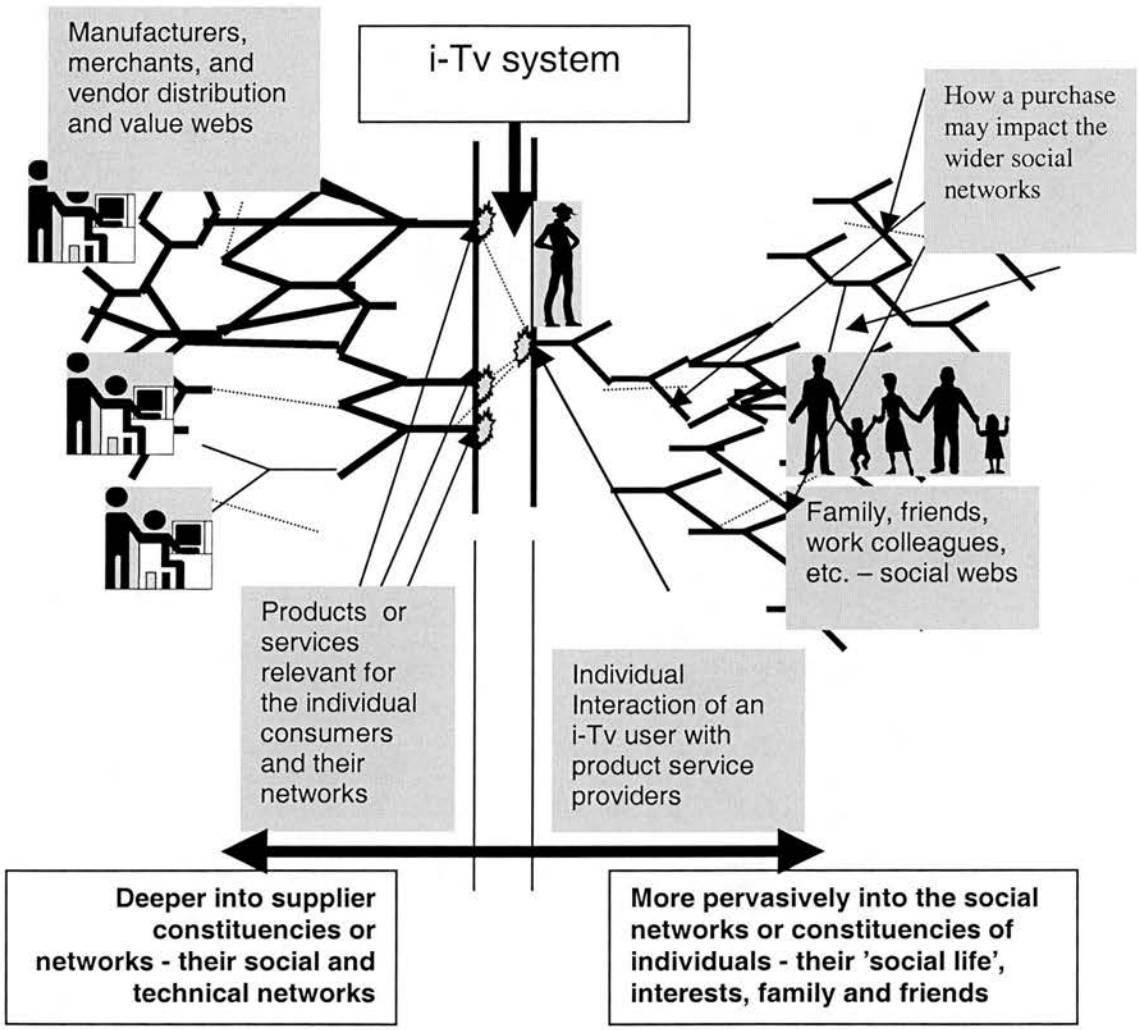

Fig 2.4 How an episode of interaction with the system has 'knock-on' effects in 'front of '(in terms of an individual's social life, as well as 'behind' (in terms of creating work, changing inventories) the screen

The major difference between researchers trying to capture a complex system and a child playing a simulation game such as *SimCity*, is that in the real world there are often no underlying heuristics or 'rules of thumb' one can realise properly, and apply so they can 'win'. The game, like the television programme, is designed for an

audience of users. Real world phenomena are always designed towards some other purpose or function, and the main task of research for evaluation or for innovation is exploration of the elements and how they come to be understood from the perceptions of those involved.[46]

Actors, actants, constituencies are dynamic, and are so at different intensities. They will not stop or slow down for the convenience of analysis. So regarding the Cambridge Trial, a question arises whether one can one truly *trial* or *simulate* networks or constituencies? The simple answer to this question is most likely *no*. In many, particularly social, senses, they have to be self-forming. Social systems are not only self-organising systems as has been stressed for example by Luhmann (1984); they are also *adaptive* systems which means that they are able to change their rules of interaction according to particular demands of their environment. The term of adaptation is to be understood in this context rather generally and not as an antithesis to self-organization: Each adaptive system is also self-organizing in the sense that it always operates according to its own logics. Environment can force an adaptive system to change its rules of interaction yet the manner of changing is *part of the self-organization of* the system and not a simple reaction to the environment.

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[46] Maxis software produce the *Sim* series of computer games. A genuine innovation, which harnesses the power of computing to generate and run simulations of cities, people, insects and worlds. The best known of the series is *SimCity*, where a player experiments with urban development. A housing development placed here, a police station there, a stadium here, an electricity station there . . . the aim is creation of a self-sustaining whole, capable of maintaining itself and prospering. Certain implicit rules are built into the game, and it presumes some knowledge of urban development and governance on behalf of the player, who as 'mayor' adjusts tax rates for citizens and dictates development policy. Raising taxes too high, not building and distributing enough fire stations, or perhaps neglecting proper sewage or electricity infrastructures will lead to problems. Natural disasters also spontaneously intervene in the development of the city, and one must cope with them by making proper additional changes. During periods that the 'mayor' is absent from his office (i.e. when the computer is switched off and one is not playing the game), events and interactions between events in the game continue to unfold. *SimCity* acts then as a concurrent reality for the player. There are little options to 'win' but through careful consideration of the many different factors and influences, the underlying models and rules of the program. By discovering them the player can control whether the city prospers or falls into decay. Millions of adults and children are working out the underlying strength and weaknesses in such models, and via dedicated web sites exchanging tips on how to 'win'.

Patterns in how people play *SimCity* offer scholars unprecedented insight into how non-designers conceptualise urban space, if only because for the first time in history, city planning as both a concept and an activity has been made readily accessible to people who probably never had the opportunity to think thought actively about city form at all. For most, the city as a total system was simply beyond their control or outside their intellectual purview.

The reason is that even with strong governance organisations, regardless of style, maintain distributed and localised facets. One fundamental difference between the social and the technical lies in the fact that while one can prototype a technology, and have people provide feedback on its use and value, one cannot easily prototype a social group. Social groups are contingent on a variety of perceptions, needs, motivations and so forth which are very complex in nature, contingent upon diverse motivations and drives, and privy to a wide range of forces and constraints, for both individual members, and for the group as a whole.

It is perhaps here that the notion of a *constituency* or *actor-network* falls short in providing a proper prescriptive treatment of dynamic development processes. Are these frames of analysis able to account for such adaptation and reflexivity at the individual level? Most likely not. They share the same limitation as most 'big picture' sociology, in that the analysis falls short on understanding the underlying reasons for change, or indeed the relative power of one actor, actant and constituent over that of another to invoke or engender change and its dynamic. Although constituencies do highlight and emphasise the role of the constituency-builder in alignment processes, they do not attempt to understand the relative power and influence in social and technological terms.

It may be better to think in terms of trials as a kind of *biosphere* where technologies and social circumstances are *cultivated* within a view that must accept the need for creation of context and the right environment. The familiar ecosystem concept - which connects a biota with its physical environment through transformations of energy, matter, and information - could be used to integrate humans and technologies with their environment. Transformation of energy and use of resources in human-dominated systems depends on the social features of humans as well as the physical environment and the other biotic components of ecosystems (Burch and DeLuca 1984).

Vast differences lie in the perception of a product between the various social groups that design, produce and provide goods and services, and the other 'group' that comes to use and consume. This can deny any opportunity for social group self-formation, particularly in the early stages of a shared exploratory exercise (such as was the Cambridge Trial). As Grudin (1986) suggests, that designers are less able to grasp 'user logic', and tend to rely on more familiar and immediate 'logics' – what Araya (1995) terms as "technical thinking" - that are useful in other problem-solving arenas, such as software or interface design problems. Certainly, Sharrock and Anderson, (1994) suggest that even when there is no direct contact with users, they often remain as a 'scenic feature' of the design process.[47]

i-Tv is a classic example of a system technology, a whole configured from a range of discrete technology elements – authoring technology, switching technology, transmission technology, set top boxes and other elements. However, being a *media system* it must also be able to convey through its technological aspect, a further 'system' of content material. This content material, rather like individual components of the technological system, is often produced by various third parties, but these must adhere to certain rules, conventions or genres to be acceptable for transmission. Only when both the technological and content systems successfully combine will any recognisable and useful system be apparent for the wider constituency of stakeholders such as content producers, service providers, retailers, advertisers, and of course consumer-users. It is these stakeholders and others such as regulators, government, competitors, service providers, carriers, press and so on – who comprise the wider social constituency of interactive television systems.

But central within these social constituents, it is the consumer-users, *their* perception of the combined system that remains critical in the assessment of the overall result of the combination of service and technology. From their view it must be capable of presenting an informative, relevant, useful or entertaining array of content and

[47] They also suggest that amongst other things 'users', there may operate within design processes as 'rhetorical devices' – " . . .being able to couch one's proposals in terms of user considerations is a powerful way of ensuring their acceptability." (p.16)

services. In many respects it should not be important for them to worry about matters 'beyond the screen'.

Since the time of Aristotle, people have believed that 'the soul' or 'the self' could distinguish humans from non-humans. Lewis Mumford (1964) suggests that the technological developments in the 20th century represented an increasing effort to fully incorporate and assimilate disobedient humans into a system of machines. Indeed the entire modernist project from the enlightenment onwards could be slated as a attempt to objectify the human within machine and bureaucratic systems and metaphors. Mumford's dystopia was clear: as technology becomes autonomous, humans become mechanised. From the industrial age onwards came the tradition of system design focused upon automation, machines that would replace human labour, increase reliability, raise productivity. But they still required human operators, and it was here that the embryonic beginnings of ergonomics and human factor engineering began. Levers, dials, buttons – some were fund to be difficult to operate physically. Later, the perceptual aspects of operating systems became of note, and later still social aspects.

But as producers were forced to change focus to domestic communications and entertainment, new prerogatives was placed upon computer developers to form partnerships with members of the creative and communications industries. Also, designers and producers needed to understand wider social and individual exigencies of the new genres of use, and more of the nature of domestic users. Now individual experiential aspects are important (Pine and Gilmore, 1999).

Preece (1993) points out that many system designers pay only scant attention to the 'human element' of human-machine interaction, with users being regarded as capable to adapting to the use of a system, 'like a cog in a machine'. Her suggestion is of a strong determinism on behalf of designers, where 'users' and 'use' are a kind of independent variable in a process of optimising machines for particular tasks. As Margaret Wheatley (1992) sees it: "We have treated organisations like machines, . . .

We have magnified the tragedy by treating one another as machines." (p.77)

Mechanistic views of humans within HCI prompted Bjørn-Andersen (1988) to directly ask the question; "are human factors human?" in an attempt to draw attention to the fact that humanising technology suggests processes that aim well beyond the simple optimisation of technology. And the observations of Bannon (1991) also brought him to question the human in 'human factors' research in their role as an 'independent variable' in a process of optimising technology. In a seminal paper: *From human factors to human actors*, he writes:

> "Within the HF (human factors) approach, the human is often reduced to being another system component with certain characteristics, such as limited attention span, faulty memory, etc., that need to be factored into the design equation for the overall human-machine system. This form of piecemeal analysis of the person as a set of components de-emphasizes important issues in work design. Individual motivation, membership in a community of workers, and the importance of the setting in determining human action are just a few of the issues that are neglected. By using the term human actors emphasis is placed on the person as an autonomous agent that has the capacity to regulate and coordinate his or her behaviour, rather than being a passive element in a human-machine system." (pp.27-29)

Notions of experiential qualities such as 'usability' 'usefulness' and 'use' surely cannot feature when one fails to differentiate between human and non-human elements, as is the position of ANT. Indeed, Callon (1998) himself puts forward that: "One of the oft-mentioned shortcomings of ANT is the poorness of the analysis that it offers in respect of the actor." Indeed, an approach of treating 'humans as parts of the system' – as cybernetic users and consumers - is ironically similar to that of the early HCI studies, or mechanistic perspectives of the organisation, or purely ergonomic views of engineering, where the human element is considered the 'problem'. Actor-networks is not alone in this style of analysis. Many earlier frameworks such as suggested by Craven and Wellman in their discussion of *The Networked City* (1973) characterised the *social network approach* by its analytical emphasis upon:

> "The primacy of structures of interpersonal linkages, rather than the classification of social units according to their individual characteristics . . . [It] gives priority to the way in which social life is organized, through empirically observable systems of interaction and reliance, systems of resource allocation, and systems of integration and co-ordination." (pp.1-2)

Caven and Wellman view that the concept of networks is scalable on a whole network level to a 'network of networks', network groups connected to other network groups by actors sharing membership in these groups. This operates in a number of ways. People are usually members of a number of different social networks, each based on different types of relationships and, perhaps, different communication media. The purely structural arrangements between people and people via communications networks may derive value from a purely structural analysis. However, such analysis can only be performed upon networks which are fully formed, sustained, and which have a perceivable structure. The structures of the social and technical networks on the Cambridge trial was constantly shifting, as they may do in many innovative, experimental-type development situations.

There are parallels here with the statistical treatments of the individual in audience research (already cited in the previous chapter) and within economics. Miller (1995) is one who, from the perspective of recent studies of consumption, criticises the primacy of economics in its study of society. He sees that economics is a social science discipline that "cut itself off from social studies," and this led to an abstracted view of the world. (p.12) He sees that political decision-making and policy relies too much on economics:

> ". . . the discipline of economics has achieved unprecedented power in the world today in large measure precisely because it has justified the complete neglect of the topic of consumption." (Miller, ibid.)

Predominately, his critique hinges upon how economists create an image of the 'aggregate' consumer.[49] Actual consumption behaviour and choices give way to an implicitly normative behaviour, representative of the rational decision making and self-interest which drive persons to consume. 'Research and development',

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[49] In audience research there is a similar criticism:

> "The procedure is one of head counting and the purpose is to artificially convert the many situated instances of consumption - ultimately unknowable in their totality - into manageable, calculable units. As ways of comprehending the lived experience of actual audiences, these methods would be doomed to failure. Within the logic of the ratings discourse, though, an 'audience commodity' is created to be traded for financial gain. Its fictionality, does not hinder its economic functionality." (Moores,

'innovation' and 'markets' are each abstractions, myths, and can often obfuscate the complexity of real-world processes and phenomena. As Wartofsky (1979) has it:

> "... our own perceptual and cognitive understanding of the world is in large part shaped and changed by the representational artifacts we ourselves create. We are, in effect, the products of our own activity, in this way; we transform our own perceptual and cognitive modes, our ways of seeing and of understanding, by means of the representations we make." (pp. xx - xxiii)

This is true, even of those studies that wish to 'open the black box' of technology, as they often 'close' or even ignore the 'box' of the individual designer or consumer-user. For instance Westrum (1991: p.172) as an example points to the fact that "the evolution and structure of a technological system are shaped by the social institution that sponsors it." Yet in the same volume he draws attention to the potency of user innovation. Economic determinism parallels technological forms of determinism in that it closes consideration of the reality of use with relation to technology.

While marketing hype can serve to carve out a space for a new product or system in the mind of the public, actually getting the technology to work according to original design, albeit within certain tolerances, the need for 'tweaking', recalculations of budgets, and/or re-appraisal of orientations and commitments, provides a necessary stage where it can be tested. There are no more relevant testers than potential consumer-users. Testing the technology using surrogate consumers – i.e. trialists – provides an attempt to realise and benchmark further problems of deployment, implementation and delivery of services. They may then wish to shift the emphasis of the trial towards a marketing phase in order to gauge an idea of an appropriate charging system and commercial potential for such services. Throughout these processes, new partnerships and alliances may form, and others come to encounter the technology and its potentials.

If the technology and its potentials meet expectations then a new successful product is realised. If it does not then it may be relegated to the domain of expensive failures. However, aspects or components of the system may be developed into separate

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1993: p.3)

products which could be successful, or there may even begin further processes of innovation and negotiation breeding a new version or revised version of the original system.

Conclusion

There is a need for the researcher to have worked out his or her theoretical approach prior to entering the field. (Cicourel, 1964) However, going in with strong hypothesis (or classification system such as in Molina's socio-technical constituencies approach) regarding the outcome or content of what will be found is a mistake which may lead to self-fulfilling prophecies. Conversely, going in without some clear idea on the form and type of concepts that one is looking for (as in actor-networks which purports to be entirely interpretivist in its approach) may lead to paralysis when it comes to carrying out meaningful observation and integrating findings.

In sum, the systems approach, and its derivatives, has been established as an attitude of mind to facing complexity; it reflects a search for the interrelatedness of things in problematic situations. The purpose of actor-networks and socio-technical constituencies is to map relations between elements, specifically for the purposes of advancing academic theory and policy-making. Opposed to physical tools, such as machines, and computers, these are *cognitive tools* aimed at expanding the horizons of researchers, designers, producers and managers. They relate "ideas to ideas, ideas to data, and data to data; they encourage team members to communicator more effectively with each other." (Cohen, 1995: p.2)

Systems comprise 'hard' and 'soft' elements, social and technical, actors, actants or constituents, function, expertise and experience. Some of these fall somewhere in between hard and soft. It is possible, with some measure of objectivity to map changes in the technological infrastructure of a network, the *technical terrain* of a given problem to define and taxonomise elements in terms of functions, specifications etc. It is also possible to map changes in organisation and to a lesser extent expertise. Technological change or innovation today often occurs as projects

such as the Cambridge Trial - events happening within the other flows of normal business that companies conduct. As such they do represent a bounded series of events and groups of participants. Many of these projects are complex in organisational character involving various actors from many different organisations. Some projects 'spin-out' becoming separate firms or as operating divisions. For instance ATML spun out of Acorn, as did ARM Ltd. Om became an operating division with their own HQ based in Cambridge Technopark. Projects are often also very complex with respect to the technology involved. Many components comprise the whole technical system or network. We must recognise that some components may have distinct legacy in what came before, that systems, perceptions even possibilities are in fact configurations. Their *uniqueness* as projects is stressed by actor-network types of analysis, however their *generative function* is stressed by sociotechnical constituencies. This was certainly the case in the Cambridge Trial where the Om STB was comprised largely of 'off the shelf' parts, the communications infrastructure was already in place and operating as a successful business, and much of the basic content material was in an already produced state. Other components need adaptation and development to respond to some, as yet, unforeseen need of the system to effectively perform its operation and function.

Within the Cambridge Trial this was creating the 'mortar' which would join the components together and get them working as an effective whole. For instance the content, comprising largely of the games and educational software), and the video footage were drawn from Acorn's education division and Anglia Television respectively. Development work was needed on both of these elements such as 'porting' the software to the system – making it work on the new platform and with the remote control rather than a PC keyboard. The video footage also required editing and digitalisation. The largest piece of 'mortar' work was the interface development. The interface has a dual-faced Janus-like quality. It is the site where not only do all the functional aspects of the system's purpose converge in relevant, purposeful and useful ways, but also the place where these functions are represented symbolically user in a meaningful way to prospective users. This is a task not only of engineering

but also of aesthetic ingenuity, employing considerable symbolic and semiotic invention, social and cognitive sensitivity and understanding, and a feel for *relation*. In addition to the interface, there were further content elements to be developed as further partners joined the content and services group – *the principal services providers* or PSPs. These included catalogue-style screens depicting goods, interactive advertisements and the online surveys and questionnaires.

While technology and organisation may be mapped, to map the complex of perceptions and influences that shapes a constituency or network is a more difficult task. These lie very much in the 'soft' end of the spectrum of systemic elements. This is the challenge of the contextual usability approach detailed later, which presents a hermeneutic model of mapping perceptions of a product's characteristics, attributes, feature and functions. ANT as a practice is inductive. It often involves prolonged and gradual acquisition of knowledge, through *induction*, data slowly evolves into concepts and specific research propositions through the investigators own increasing skill and understanding. This characterises it from sociotechnical constituencies, which carries the implication that all conceivable interactions are already partitioned and classified, and it is simply a matter of 'filling in the spaces' so to speak. It is comparatively *deductive*. But this is not unlike many approaches favoured by industry. Quality tools such as QFD, and even usability engineering approaches, offer prescriptions for industry practitioners who have not the time nor resources to engage in a protracted research project. Here lies the difference between research for academic ends and for achieving practical results.

Silverstone (1994: p.85) questions the relevancy of systems and actor-network models, in their preoccupation with the processes of the production of technologies (which they most definitely share with socio-technical constituencies and many other social constructivist style studies i.e. Pinch and Bijker). Both actor-networks and constituencies sublimate or 'black-box' the use process and any other form of experiential aspects of the product. They intentionally do so to focus analysis upon the relation of parts within the system, actors, actants or constituents that they

come to identify. Both are theories rich in concepts, and have both developed a specialised vocabulary. Most importantly both are also *emergent*, themselves under continually development, and lack any real set of heuristics on 'how to do' or 'how to be applied'. The leaning in this thesis is towards constituencies but it would be erroneous to ignore some of the useful aspects of actor-networks that are missing in constituencies. Most prevalent here is the semiotic aspects which drive and motivate technical projects, while there is emphasis upon the strength of these aspects in actor-networks, constituencies tend to incorporate symbolic attributes under the heading of 'perceptions' or 'perception building'.

However, one of the major criticisms is that the actor-network theorists make very few references to sources outside the fields of sociology, and history of science and technology. But the same can also be said of Molina's sociotechnical constituencies. Both carry the tradition of general systems theory in that they wish to offer an overarching explanation for processes that are indeed extremely complex in nature, and difficult to explore in detail as well as depth. But like their industry counterparts, they do provide insights which help to develop an impression of the 'big picture', which in turn can stimulate the creative mind of the reader.

Chapter 3 – The Contexts of Use

"What IS the context of design? I seem to have two answers: it is our minds, our lives, as persons, as beings able to always imagine, to perceive, to remember, and to be, beyond the range of whatever others and we may try to serve our need or to control our behaviour can foretell; It is also 'evolution'. The so slow, and seemingly mindless evolution of all things, natural and artificial, which so often seems to exclude the 'most rational' or 'most intelligent' actions and to encourage what looks like sheer stupidity." (Jones, 1991: p.204)

"Contrary to our normal ways of thinking . . . Openness to environmental information . . . spawns a firmer sense of identify . . .high levels of autonomy and identity result from staying open to information from the outside. We tend to think that isolation and clear boundaries are the best way to maintain individuality." (Wheatley, 1992: pp.92-93)

Introduction

The previous chapter closed with the suggestion that holistic treatments of product and service development processes should go beyond simple identification [or classification] of social and technical elements (or constituents). It must also consider their interrelation and interaction as producing *outcomes*, and perhaps more importantly, *experiences*.

This chapter is chiefly concerned with outlining the underlying principles of *contextual usability* (CU) an approach developed concurrently with, and in relation to, issues arising from the Cambridge Trial. CU was influenced by more general shifts in epistemology and research practice that began to manifest in human-machine interaction (HCI) research and social studies of technology in the early 1990s. At this time, these fields, and others such as cultural studies, audience and consumer research were coming to place a greater emphasis upon *microsociological* levels of analysis – i.e. focusing mainly upon individuals and groups. They also had an interest in the influence of localised social environments, technologies and mediated information upon individual perceptions. To do this they were employing the use of more interpretist, naturalistic and ethnographic approach in their study.

Within industry this change gave birth to the much-vaunted *consumer-orientated* approaches in business practise and marketing, and to the similarly acclaimed *user-centred* design principles within the development of technology and services.

Brach defines contextual knowledge as: "knowledge linked to the context in which it is gained rather than formal knowledge." (p.2) Erlandson *et al.*, (1993). point out that *naturalistic inquiry* is very dependent upon context:

> "This stems from its fundamental assumption that all the subjects of such an inquiry are bound together by a complex web of unique interrelationships . . . [this] provides a context that at one time both restricts and expends the applicability of the research . . . context provide great power for understanding and making predications about social settings . . . Interpretation is both limited and enriched by context." (pp.16-17)

While an outcome (i.e. profit, the development of skills or attitudes, or perhaps a function or purpose) is something often shared between individuals, the nature and quality constituting 'experiences' tend to be much more personal and subjective. Following Woolgar (1996) and Mackay (1995) in their advocacy of extending the social shaping perspectives of technology by applying some of the thinking of media and cultural studies:

> "Design and development processes may encode preferred forms of deployment in a technology (via its technical possibilities), which are reinforced through marketing. It is in this semiological sense that one might propose that the technology is a form of text. . . .The subjective social appropriation of a technology is . . . a crucial force in the social shaping of technology – one which cannot be 'read off' from either the physical technology or the social forces behind its development." (Mackay; p.45)

Who we are, what we know, what we are familiar with, and how we cope with change all matter towards how we accept, or do not accept, the products they come to be made aware of.

Why focus on users?

But why focus on customers or users? What do they know of the difficulties of design and risks of big development or advertising spends? Are they not waiting in the wings with bated breath for new and enhanced products with wonderful new features? Everyday on the high street, following rules of engagement which were developed over hundreds of years, restaurants dictate via their menus, and shops display their wares with little consultation with customers. They represent and dictate what the owners/managers wish to offer, or what the buyers decide what is 'in' and fashionable. Even 'post-fordist' manufacturers such as *Benetton* (see Livingstone and Lunt, 1992) rely upon trends registered by sales, opposed to pre-empting what customers like or dislike about existing products (I shall cover this more depth in the following chapter discussing system-logging of use and consumption by digital systems). As a consumer, one can choose to eat or buy there or move on. Producers may even change their layout, staff, displays, and deco. There very rarely consult consumers regarding substantive issues. Choice is selection, not involvement. Why should it be different for technical innovation? Indeed, in the case of major or

'radical' innovations, a number of commentators have suggested that consumers may have difficulty linking characteristics with outcomes (Westrum, 1991; Ortt and Schoormans, 1993). Indeed Tauber (1974) puts the case against user-centred approaches, when he says that most innovations, and the need for them, are 'beyond' the foresight of most consumers. Perhaps good reason why, beyond lip service paid to adopting user- or consumer-orientated approaches to service or design, many high-tech products rely on presumptive consumer needs rather than on any 'real' identification of potential 'buyers' desires (Shanklin and Ryans, 1984). Proctor and Williams (1994: p.4) see that part of the reason for this is that: "end-users and designers don't inhabit the same environment and share a common practice."

The are many convincing cases from the field of architectural design that clearly illustrate the consequences of disregarding user needs in design. Arguably the most infamous of these was the *Pruitt-Igoe Project*, a product of the United States post-war federal public-housing program. Completed in St. Louis in 1956, this mammoth high-rise development was an overly optimistic rationalisation of social design principles, for the most part influenced by the radical French architect Le Corbusier.[49]

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[49] Although the architect Le Corbusier never designed any buildings in the United States, the progress of urban renewal in the U.S. enabled developments that greatly mirrored his style in their density and open space characteristics – such as the Pruitt-Igoe developments. Hall (1996) considers the meticulously ordered and clean environments of Swiss cities as a major influence upon the young architect. Coming from a family of watchmakers, led to such declarations as "a house is a machine to live in." (cited in Hall, p.204) Hall suggests the problem of such an analogy " . . . people are not escapements, and society cannot be reduced to clockwork order." (p.205) Hall further suggests that Le Corbusier's vision was shaped by his life in Paris. He apparently hatched a plan to obliterate the historic core of Paris north of the Seine, and replace it with eighteen, 700-foot high towers. His view was that, " 'the design of cities is too important to be left to the citizens - we must decongest the centres of our cities by increasing their density. In addition, we must improve circulation and increase the amount of open space." (p.207) The contemporary city planned by Corbusier;

> " . . . was to have a clearly differentiated spatial structure. And this was to correspond to a specific, segregated social structure: one's dwelling depended on one's job . . . The center of the city would be the office towers of the elite, including industrialists, scientists and artists . . . Twenty-four of these towers would provide for between 400,000 and 600,000 top people's jobs at 1200 to the acre, with 95 per cent of ground space left open . . . Outside this zone, the residential areas would be of two types: six-storey luxury apartments" for the elites, "with 85 per cent of ground space left open, and more modest accommodation for the workers, built around courtyards, on a uniform gridiron of streets, with 48 per cent left open." (p. 209)

Le Corbusier had no time for any kind of individual idiosyncrasy; well did he call them 'cells'. Likewise, the units "would all contain the same standard furniture. Possibly, he admits, 'my scheme . . .

Twenty years is a very short 'life expectancy' for buildings in view of the tremendous investments. This particularly so if compared it with pre-modern architecture which, in European cities, has survived over hundreds of years, and which remains a major attraction for much tourism. But Pruitt-Igoe does live on. It does so symbolically as an icon of the failure of overly rationalistic and overly-presumptive design ideals. Indeed, it is often taken as symbolic of the whole modernist programme in society.[51] Liberals perceive it as exemplifying the government's appalling treatment of the poor. Architectural critics cite it as proof of the failure of high-rise public housing for families with children (Hall, 1996).

Within the space of only a few years, disrepair, vandalism, and crime plagued the development. The project's recreational galleries and skip-stop elevators, once heralded as architectural innovations, had become nuisances and danger zones. Large numbers of vacancies indicated that even those desperate for housing preferred to live anywhere but the project. In 1972, after spending more than $5 million in vain to cure these problems, the St. Louis Housing Authority, in a highly publicised event, demolished three of the high-rise buildings. A year later, in concert with the U.S. Department of Housing and Urban Development, it declared Pruitt-Igoe unsalvageable and razed the remaining buildings.

It was only *after* the fact that sociologists were brought in to forensically explore why the well-intentioned design principles failed. They found that; "a solution appropriate for a particular group of people was provided for tenants with very different sets of

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at first might seem to warrant a certain fear and dislike.' But variations in layout, and generous tree-planting, would soon overcome this." (p.209) Quite obviously Le Corbusier's vision was not only of architecture but of social engineering. Hall sees that, "His simple-minded egomania and his total political naivety made it difficult for him to understand his failure." (pp. 211-212)

[51] In *The Language of Post-Modern Architecture* (1987) Charles Jencks proclaims the death of high modernism. In doing so, he is able to time that death to the moment - the cloudless July 15 in 1972 when the first three building of St. Louis's infamous Pruitt-Igoe housing complex were dynamited. Indeed, Jencks is even able to provide the cause of death: the inability of this *architectural style* to create liveable environments for the poor, in great part because the poor are not the nuanced and sophisticated "readers" of architectural space the educated architects were. Jencks's argument in this book is for a semiotic reading of architecture -a reading he believes is possible with post-modern architecture, which is much more clearly referential than high modernism.

needs, values, and attitudes toward housing and the use of space." (Lang *et al.*, 1971: p.15) This is perhaps an outstanding example of how design, independent of sampling or capturing the needs and requirements of potential and actual users, can lead to unforeseen or even disastrous consequences. I have already drawn attention to the fact that without the capturing of needs and requirements, explicit and tacit, of those who will use, consume or live with a product, designers or planners have no option but to rely upon their own logics regarding what they produce. But it remains that what *can be* discovered, what is *possible* to discover, and what is *necessary* to be discovered, are quite different in terms of their attainability.

Design Presumption

Jenny Preece in her book on usability offers a cartoon which poignantly suggests the problems of design presumption. Two horses are piloting an aircraft and obviously experiencing some difficulty in using the controls. One turns to the other and says, "darn these controls, who designed them – racoons?" The suggestion is clear. There is often a deficit between design intentions and purposeful use. Another example of presumptions are made *in*, and *of* design comes from Richard Dawkins when he quotes the theologian William Paley at the beginning of the nineteenth century. Paley provides an interesting example that captures the apprehension of the layperson of a complex design. Paley noted that watches are very complex and precise objects. If one were found on the ground, it would be difficult to believe that such an object had been created by random chance. Instead the inclination would be to suppose:

> " . . . that the watch must have had a maker: that there must have existed, at some time, and at some place or other, an artificer or artificers, who formed it for the purpose which we find it actually to answer; who comprehended its construction, and designed its use." (Paley, quoted in Dawkins, 1986: p.41)

Until the mid-nineteenth century, when science was still very much tied to religious belief, the thinking regarding 'use' or 'purpose' extended to human biology. Leonardo da Vinci's 'Proportional Study of Man in the Manner of Vitruvius' was drawn about 1487. Renaissance thinkers saw a kind of mathematical perfection in the human form. This image depicts the human body within the ideal form of the circle and within the perfect proportions of the square (see below).

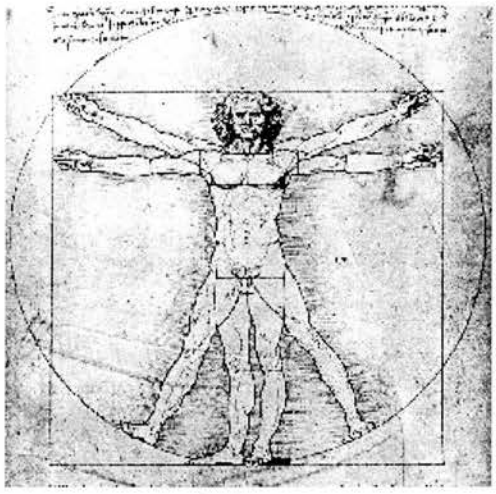


Fig. 1.2 Leonardo Da Vinci's 'Proportional Study of Man in the Manner of Vitruvius' in Kemp (1981: p.115)

Later, philosophers considered that man, cast in the image of God, was the *microcosm* regarded "as a universe in miniature." (Godwin, 1979: p.68) 'Everything' converged symbolically upon the human body (see below). It was considered that since the internal organs possessed separate functions but nevertheless relied upon each other for sustenance, then it was rational to consider mankind as an instance of something that also must have some implicit purpose.

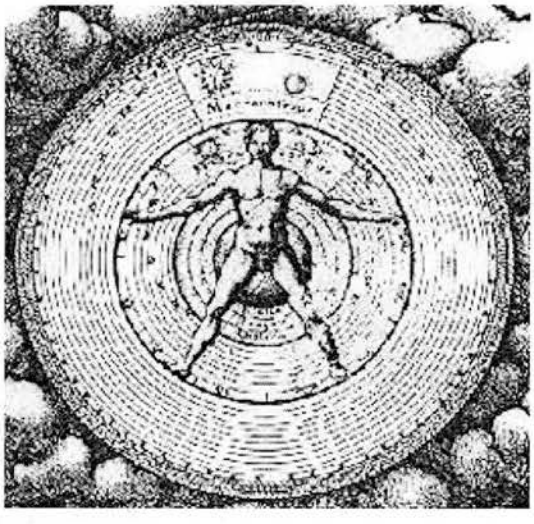


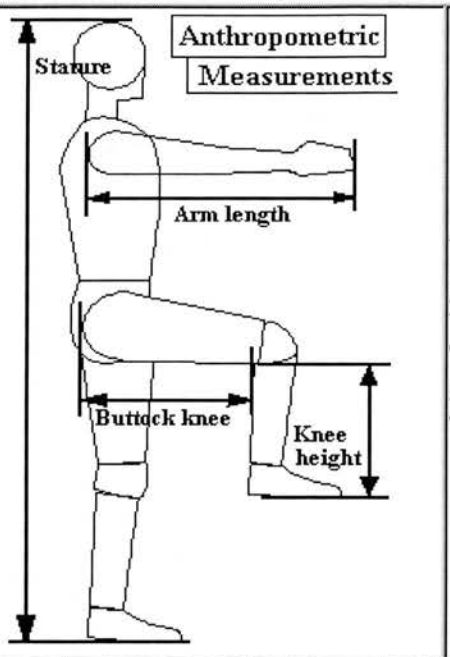
Fig1.3 Robert Fludd's (1617) 'Macrocosm and Microcosm' in *Utriusque cosmi historia* (reprinted in Godwin, 1979: p.60)

But only God, who was viewed as residing at the top level in the hierarchy of order, would know of this. The notion of use in Paley's example, applied to human beings, could only be a matter of divine providence. Dawkins' example highlights something of implicit nature of the concept of 'use'. In particular it draws attention to the relevance of its application under certain conditions and in particular circumstances, and its awkwardness in others.

But notions of use have changed. The advent of the enlightenment, empiricism, the rise of positivism and the scientific measurement of human attributes came to be reinforced by in the late 19th century by the emerging fields of physiology and experimental psychology (Meister, 1999). They came to provide useful data that could provide some index of *generalisable* human characteristics and capacities. This was becoming more relevant with the growth in [standardised] machines used in industrial settings which gave rise to issues of safety and productive efficiency (machines having dials, levers etc. *conveniently situated* and *easy* for the human hand to operate). It also had a very relevant place in the design of mass manufactured products. It was becoming necessary to design products that will be appropriate for multiple users, and that would cater for the largest percentage of the general population.

A strong example here today is the car industry. This industry, with a strong tradition in mechanisation and automation has carried out a great deal of research on the dimensions of the human body, mainly because it is vital for comfort and safety reasons for a car seat and dashboard controls to be correctly suited to the human body. Most car seats are designed to be able to fit on 95% of men and all females. The 95th percentile value for male seat breadth is 421mm. If the width of the seat was only 362mm, the 50th percentile value for females, then 50% of women would not fit on and 70% of men would not fit. The following table shows some of the data that is available to car designers.

Table 1.1 Anthropometric data adapted from MIRA (Motor Industry Research Association) reports and they are representative of British Car Drivers.



The data presented here is adapted from MIRA (Motor Industry Research Association) reports and they are representative of British Car Drivers. The diagram on the left explains the different dimensions. All the figures are in millimetres.

Seat breadth is the distance between the hips when seated

Males			Percentile Value						
Dimension	Mean	Std Dev	5	10	30	50	70	90	95
Stature	1738.1	68.00	1626	1655	1704	1737	1773	1824	1851
Buttock knee	610.7	29.16	563	574	596	611	626	647	659
Knee height	563.4	28.19	520	529	548	563	578	600	611
Seat breadth	375.2	26.08	336	344	361	373	387	410	421
Arm length	786.3	34.78	730	743	768	784	804	832	844
Females			Percentile Value						
Dimension	Mean	Std Dev	5	10	30	50	70	90	95
Stature	1624.5	56.01	1537	1553	1594	1623	1652	1699	1719
Buttock knee	600.9	26.89	560	567	586	601	616	636	646
Knee height	540.6	26.73	499	507	526	540	553	575	588
Seat breadth	364.0	26.92	325	333	349	362	376	399	412
Arm length	721.8	30.34	672	681	707	724	736	760	771

Today, the notion of 'use' applied within the context of sentient human beings highlights particular problems of ontology and epistemology, particularly in the fields of artificial intelligence and cognitive science. Finding generalisable human traits, and using them to design artefacts and objects remains a double-edged sword. The discussion offered at the end of the previous chapter cited the concerns of as number of HCI commentators that the role and place of human in the design of computers

and computer systems has been somewhat compromised. It would seem that the project of much of this kind of research is an attempt to get to a standard image of the human being - a scientifically designed version of the Leonardo's *Man in the Manner of Vitruvius* - but maximise market relevancy and profit. To speak of the 'use' of human beings is a politically charged issue which is suggestive of emotive issues such as embryo research, slavery, or at the very best 'Taylorism' and 'Fordism' – treating the worker as 'cog' in the machine.[52]

But closely tied to the notion of the use of other human beings are the *roles* we play in everyday existence. Erving Goffman's *The Presentation of Self in Everyday Life* (1959) provided a detailed description and analysis of process and meaning in mundane interaction. Interaction form this perspective is viewed as a "performance," shaped by environment and audience, constructed to provide others with "impressions" that are consonant with the desired goals of the actor (p.17). The performance exists regardless of the mental state of the individual, as persona is often imputed to the individual in spite of his or her lack of faith in - or even ignorance of - the performance.

However much we perform particular roles for other people, and for institutions, 'use' appears as clumsy applied within the context of the 'function' of human beings, but it is also so within the context of familiar technologies. For instance we do not commonly refer to our 'use' of television, but rather how we 'watch' or 'view' it - its 'role' within our lives. Abilities to somehow sample or capture such explicit or implicit understandings of systems can be relevant for the purposes of informing innovation, or for evaluating technology. For instance how does the concept of the 'use' of television (i.e. as a babysitter, friendly sound in an empty house etc.) compare with the notion of 'viewing' it?

A recurring design presumption, either in a technical or social sense, would have that individuals are *either* fixed *or* flexible and adaptable. They are fixed terms when it

[52] Also interesting to note here the notion of the 'abuse' of children. While their may be legitimate *use* of drugs, what is the 'use' of children?

comes to predicating how they will use or value something. Such as when users are 'crystallised' into the mean of their characteristics by the use of anthropometric, or other ergonomic data. Alternatively they are also viewed as flexible or adaptable when it comes to matters of learning to cope with, or use idiosyncrasies of the design. This has been the approach of statistically informed views of [massed-] society and the economy, where those who lie outside the 'bell-curve' of normative behaviour, size and ability are viewed at best, as anomalies not economically viable to be catered for, or at worst, misfits and deviants. It is within this frame that 'universal design' (i.e. Keates and Clarkson, 1999) – design which strives to cater for persons of all kinds of abilities – has developed.[52]

Interpretation and hermeneutics

I have suggested, citing *actor-network theory*, and Johnson's *cultural circuit* concept that ideas about technologies perpetuate between interest groups, company functions, manufacturers, standards committees, distributors and many others. As myth or fact, ideas impact, shape and culminate in a final product offered to end consumer-users.

The products themselves, their characteristics, attributes, features and functionalities, combine with the discourse accompanying their passage into the marketplace via marketers, distributors, agents, retailers - situated individuals in various environments - social, physical, geographical and cognitive - who confirm, dispute or verify the value of the product and any accompanying myths.[53] Each of these help propagate the culture of production.

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[52] A number of different terms have been used to describe the goal of non-exclusive design. These include: Design for Disability; Universal Design; Transgenerational Design; Design for All; Design for a Broader Average, and other terms (Hewer, 1996)

[53] According to Donald (1991) the most significant achievement made possible by the use of language was 'mythic invention'. Exploiting the fundamental narrative organisation of oral language (such as suggested by Bruner, 1986), language-using cultures began to construct overarching myths in order to explain human existence and its relation to the non-human world. As Donald argues: "Myth is the prototypical, fundamental, integrative mind tool. It tries to integrate a variety of events in a temporal and causal framework. It is inherently a modelling device, whose primary level of representation is thematic." And on this basis he concludes: "modern humans developed language in response to pressure to improve their conceptual apparatus, not vice versa." (1991: p.215)

I have already suggested that the physical product or the service outcome straddles the realms of 'cultures of production' and 'cultures of use'. But they can only do this through consumer-users carrying out the acts of appropriating, consuming and using the product, all be it in different ways, and even for different ends. These ends also come to shape the myths and realties of what is finally produced in the marketplace. The success of some products and the failure of others suggest that there is perpetual tension upsetting any notion of symmetry and balance between the visions and realisations of these two cultures. This process can be understood to be a process of communication, a form of communication between producer-designers and consumer-users. For instance in manufacturing such as quality function deployment (QFD) practitioners speak, using linguistic metaphors, of parsing the 'voice of the customer' with the 'ear' of the engineer (Hauser, 1988; Hauser, 1993; Hauser and Griffin, 1993).

Based on anthropological, neurological and linguistic evidence Donald (1991) suggests four stages in the historical development of human cognition (all of which remain still active): episodic (case-based), mimetic (tacit, gestural), mythic (linguistic) and modem (based on extended memory: pictures, writing, computers). The invention and refinement of spoken language must have brought about a radical shift from the cultures preceding that of Homo sapiens. Speech added a new and more powerful mode of interpersonal interaction, utilising a representational system with greater precision and comprehensiveness of reference to objects and actions and their location in space and time. It also provided means for reflectively connecting events through relationships of purpose, reason and causality and so for the development of narrative meaning making (Clarke, 1992). This eventually crystallised into writing and other forms of depictions.

Whereas written texts date back some 5,500 years, the earliest example of a *mass produced* text is understood to be the printing of the *Mazarin Bible* using movable type designed by Gutenberg in 1456. Printing as a technique diffused quickly across Europe and by 1500 some thirty thousand different titles had been produced (Black

and Bryant, 1995). The wider availability of books engendered and enabled wider literacy, but also the potential for *differing interpretations* of the same text. This was particularly pertinent in relation to religious texts where individuals and groups could sequester themselves with the Gospel and develop interpretations that were at variance with church dogma. Black and Bryant suggest this as a key reason why the Christian Church began to fragment into different denominations. Not only does this serve as an example of the potency of media and media technologies in influencing social institutions and human affairs, but it also suggests that similar or identical objects – in this case text – can have varying meanings for individuals and certain groups: "texts are always open to multiple interpretations." (Thomson, Locander and Pollio, 1989: p.147)

Hermeneutics is a practice whose roots lie with the interpretation of sacred texts. The aim was the elucidation of divine meaning through close reading. It came to the recognition that individual textual components have to be dealt with as part of a larger whole. Its practice became more widespread moving beyond the confines of the church, where it was believed that in principle it was possible to determine an 'objective' immutable meaning in a text, either as intended by the author or as contained in the text itself. This was termed 'hermeneutical theory'. This relates to technical products and Woolgar (1996) sees that products are created *intentionally* to perform certain functions and to fulfil certain needs of certain groups of people. He notes that increasingly, considerable effort is employed on the part of designers and marketers to employ appropriate research to fulfil such intentions.

Betti (1980) believes the text as a process of the author making his mind objective. The 'task' of the reader or listener is to re-experience, re-cognise, and re-think (*Verstehen*) what the author originally felt or thought (Bleicher, 1980: pp.110-112). Betti viewed that *misunderstanding* occurs with *increases in space and time* between the author and reader. Philosophical hermeneutics took the position that interpretations are not decidable. In other words understanding is not the objective re-cognition of an author's intended meaning, but instead it is a practical task in which

the interpreter is changed by becoming aware of new possibilities of what it is to be a human being. Phenomenological hermeneutics is based largely on the work of Paul Ricoeur and mediates between a recapture of an objective sense of the text and an existential appropriation of its meaning into understanding. Semiotic-structural analysis acts to show how the text works and what it says before the sense of it is used to give insights into the interpreter's own situation.

Pre-understanding

A key concept emphasised in hermeneutics is *[pre-] understanding*. This follows from the recognition that:

> " . . .prior to any interpretation, we and the object of our interpretation exist. In advance of any reflection, we belong to a cultural world. The implication of being-in-the-world is that the interpreter and that which is interpreted are linked by a context of tradition – the accumulation of beliefs, theories, codes, metaphors, events, practices, institutions, and ideologies (as apprehended through language) that precede the interpretation. While taken for granted, ordinarily unnoticed, and never made fully explicit, tradition nonetheless weaves together the interpreter and that which is interpreted. " (Arnold and Fischer, 1994: pp.56-57)

Here, Arnold and Fischer raise a theme that should be familiar in this thesis. Specifically, this is the interrelation and interaction between cultural contexts, objects and situated individuals. This chapter considers that interpretations of technologies can gain from the adoption of a hermeneutical position in their analysis. Such a position has been advocated by a number of commentators, perhaps most obviously by Steve Woolgar (1991), who suggests that technology be treated as 'text':

> "When construed as a text, technology is to be understood as a manufactured entity, designed and produced within a particular social and organizational context. Significantly, this is often done with particular readers or sets of possible readers in mind - it is fabricated with the intention that it should be used in particular ways. On the consumption side, the technology is taken and used in contexts other than, and broadly separate from, its production." (p.92)

There was also the application of theories drawn from the fields of cultural, media and communications studies – most notably Stuart Hall's (1980) encoding/decoding model - which has been extrapolated into the realm of technology innovation and

diffusion studies (MacKay and Gillespie, 1992). The aim here was expansion of the social shaping models advanced by social contructivists such as MacKenzie and Wajcman (1995). While these social-shaping models tended to focus on the production of technology, as well as macro level sociological processes, it was felt that they neglected the mechanisms of apprehension, appropriation and consumption - the *individual* responses to technology.

Also contributing to micro-level sociological analysis is the work of Roger Silverstone and Leslie Haddon (such as in Silverstone and Haddon, 1996). They argue, following the cultural studies perspectives offered by researchers such as Johnson (1986), for a view of innovation as a social and cultural activity; every bit as much as a political and economic activity.

Each context may either promote or abate the innovation and diffusion of new products, and so shapes technology development as well as the circumstances and situations leading to use. Not least of these is technology itself, and its path-dependencies, certain forces that constrain, if not the cognitive aspects of shifting to new frames of thought, certainly the economic and other defining aspects of innovation. This again picks up Molina's argument in favour of sociotechnical constituencies over actor-network approaches to the study of technological development. To ignore the 'technical terrain' what is available and pre-existing in terms of the state of the technology and its legacy in standards etc. is to attempt to start from a clean slate with every study. Other pre-existing influences include the competencies of the firm, its accumulated knowledge, and the economic climate. Rycroft and Kash (1999: p. 162) suggest there are at least five major sources of path-dependence: culture, organisational learning, technological compatibility, standards-setting processes, and industry strategy and public policy. Hughes (1983) speaks of the accumulation of knowledge, funding, educational resources and so forth that propel a system technology towards institutionalisation, apparently under its own 'momentum'. And David (1975) found ample economic reason for *path-dependency* in technological development.

Nathan Rosenberg (1994) sees that the frameworks which are developed by major innovations constitutes the initiation of path-dependent activities which may extend over decades, and by which later developments cannot be understood except as part of an historical sequence:

> ". . . there is always a huge overhang of technological inheritance which exercises a powerful influence upon present and future technological possibilities. Much technological progress at any given time, therefore, has to be understood as the attempt to extend and further exploit certain trajectories of improvement that are made possible by the existing stock of technological knowledge. There are continuities of potential improvements that are generally well understood by engineers and product designers. Expert knowledge of the working of the vacuum tube did not provide an adequate basis for a "discontinuous leap" to the transistor. However, once the transistor was invented, it created a set of opportunities for further improvement by pursuing a trajectory of miniturization of components (including integrated circuitry) which has occupied the attention of technical personnel for nearly half a century." (p.16)

This does not suggest the inevitability of certain innovation events, but rather that certain orientations are easier than others in terms of cost and development and so place certain delimitations on the universe of choice. Rosenberg also argues that technical knowledge is cumulative, and this gives rise to a certain degree of 'soft determinism' (i.e. Pool, 1983; Grint and Woolgar, 1997) concerning the probable way in which a technology may develop.[54] He sees that technical knowledge develops in 'path-dependent' ways.

Following a similar line to Hughes and Rosenberg are a number of other commentators who have identified with the complex of forces that constrain and drive innovation, predicating and biasing development towards certain directions. While maintaining specific meanings and placing different emphases on technology social or economic factors, they all refer to the way in which innovation activity is

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[54] Heilbroner (1972/1994) recognises that technology itself is the result of social activity, and that the nature of technological advance is responsive to social influences. However, he goes on to argue that under certain conditions technology can even become autonomous and itself determine advance - such as when the forces of high capitalism have been unleashed. In such periods technology is allowed to determine progress.

constrained. Dosi (1982) with *technical paradigms*; Nelson and Winter (1977) with *technological regimes*; Sahal (1981) with *technological guide posts* and Utterback (1979,1994) with *dominant design*; Georgiou *et al.* (1986) with *technological corridors* - each suggest that the multiplicity of choices at the onset of a development closes according to similar forces. Put simply the suggestion is as Bucciarelli (1994: p.198) sees it that: "No design begins with an absolutely clean sheet of paper. Last year's model, a competitor's product, the availability of new tooling, new materials . . . are situated within historical, political and cultural contexts." And "The history of technology is contextual to the history of the industrial structures associated with that technology." (Dosi, 1982: p.147)

One explanation of why trajectories and path dependencies exist can be found in the idea of *absorptive capacity* (Cohen and Levinthal, 1990). A firm's absorptive capacity is directly related to the knowledge the firm possesses and their experience. It is through absorptive capacity that a firm can understand and recognise the value of a new technology. Thus, the existing technologies in a firm give that firm knowledge and experience which is then used in understanding and evaluating new technologies. A new technology that lies too far outside the firm's technological paradigm will be difficult to understand because the firm will not have the necessary knowledge. A similar frame of understanding can be levelled at consumer-users. People invest time into establishing and refining behavioural routines (set allocations of time) through the process of learning and negotiation with the institutional frameworks that they exist in. As Shackle, (1963) has it: "Each of us builds the unique structure of his or her personal existence out of countless stereotyped patterns of action." (p.18) Radically new products, perhaps too far removed from obvious or familiar function, will not be attractive to all but the most keen of early adopters. Most will appear of little value, even of 'no use'.[56]

[56] Yves Punie is one a only a few researchers who have confronted the notion of non-use in a direct manner. In his paper ' Imagining "non-uses": Rejections of ICTs in Flemish households' (1997) he found that when people were asked to respond to the open-ended question why they do not own or use particular ICTs, their main reply was that they had 'no need'. Other factors such as 'financial constraints' were represented only minimally, both in relation to the costs of the services, as in relation

Rosenberg (1994: p.5) asserts that for firms; "acquiring new information is costly," and this is true whether this is data regarding new technology, the development or recruiting of new expertise; or for learning about consumers and markets. Sometimes it is easier to justify and invest in software expertise, or new plant than in market or consumer research. Path-dependencies, technological trajectories etc., while positive and negative with respect to innovation (i.e. they can constrain as well as create the conditions for opportunity and creativity), they certainly do create distance between 'cultures of production' and 'cultures of use'. Their influence forms a considerable part of the 'technical thinking' Aryaya (1995) which defines the problem solving process of technology development. But they do act to constrain he possibilities of what populates market place and ensures for consumers a succession of devices which [sometimes] offer some form of improvement ver previous models, versions etc.

From the emerging field of the management of technology, Fleck's (1988, 1993) notion of *innofusion* (a blend of innovation and diffusion) suggests that innovation of particular technologies (his example was industrial robots) can only be fully realised, through their diffusion into sites, existing expertise, and process of implementation. It suggests that workplace contingencies are idiosyncratic, composed of individual and diverse influences stemming from accumulations of formal and informal levels of knowledge, ways of doing things, and other technologies. This suggests the need for plasticity in the functional design of technologies, and concerted innovation effort on behalf of users and management.

The advent of sophisticated graphical interfaces and the wider diffusion of PCs contributed towards a massive resurgence in user-centred design methods in the 1980s. Carroll (1997) notes that by 1990 there was a clear consensus that the cognitive modelling approach had failed to provide a comprehensive paradigm. An 'ethnographic turn' was arising in human computer interaction studies, overturning the laboratory bias that was inherited from HCI methods developed from cognitive science and experimental psychology (which I have already touched upon earlier, and

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to their own scarce money resources.

will do so in more depth in the following chapter). One particular approach, which precipitated out of this epistemological change or paradigm shift, was *contextual inquiry* (Raven and Wixon, 1994), and *contextual design* (Wixon, Holztblatt, and Knox, 1990; Holtzblatt & Beyer, 1997). Contextual Inquiry (CI) techniques were first adapted from ethnographic research methods to fit the time and resource constraints of engineering environments (Holtzblatt & Beyer, 1997). CI presumes idiosyncratic contingencies arising from implementation, and aims to collect data on users, knowledge and work practices in the actual environment of use.

Davis' *Technology Acceptance Model* (TAM) (i.e. Davis, 1986; 1989; 1993 and Davis *et al.* 1989) is a further example of an attempt to unpack the distinctive relations between *perceptions* of a technologies use and utility, compared to its *actualised* use and utility. The notion of *perceived usefulness* is defined as the degree to which a person believes that using a particular system would enhance his or her job performance. *Perceived ease of use* (the degree to which a person believes that using a particular system would be free of effort) (1993: p.320).

A common shortcoming of all these studies, as previously suggested, is that many of these fields of research (Fleck, Davis, Contextual Inquiry) have tended to focus on machines for office and industrial environments, and whose underlying ethos is improving efficiency, productivity or the improvement of safety. It is a fact that business has so far been the major site for computer developments, with well-established IT budgets aimed at continuously adopting new information technologies to remain competitive, raise productivity, and improve decision making (Alavi & Joachimsthaler, 1992; Straub & Wetherbe, 1989). Even when Davis' speaks of perceived usefulness, it hinges upon: "the degree to which a person believes that using a particular system would enhance his or her job performance." (Davis, 1989: p. 320)

I have already gone some way to highlighting the unique properties of television as a technology, and of the home as a space of use and consumption. Purposeful activity in the home can be quite different from that of the workplace.

> "The experiential fact that people voluntarily accept considerable inconveniences to drive the car of their dreams, live with the furniture that they like, or wear clothes for which they are admired, suggests that other then technical criteria dominate everyday life and individual well-being." (Krippendorf, 1995: p.157)

And so it needs a different scope of sensitivities when approaching the capture of relevant data for informing design or for its evaluation. More general consumer research (e.g. Miller, 1995) whose focus has always been on a wide variety of products perhaps lends a more relevant frame for the study of technologies which are aimed for individual use. Even Donald Norman, concedes that usability may pall against other, culturally defined aspects of products:

> "In the consumer economy taste is not the criterion in the marketing of expensive foods or drinks, usability is not the primary criterion in the marketing of home and office appliances. We are surrounded with objects of desire, not objects of use." (Norman, 1988: p.216)

Researchers such as Erdem and Swait (1998) have argued that the equity endowed by consumers to a brand arises from the value the brand provides them in terms of reduced search costs and decision simplification. There is the suggestion that brands and the particular features that differentiate individual products will mark out their place in the market place, and ultimately consumer consciousness. However, this focus on brand and features tends to obfuscate the phenomenological aspects of the product that locate it within an individual's everyday life. Marketing focuses mainly upon the point of consumption, and design informed by such thinking concentrates also on point of sale - i.e. designing a consumer electronic so that it will stand out - style wise- on the retail display amongst others.

Earlier I refered to the inadequacy of the term 'task' when applied in the instance of interactive as well as traditional forms of television. It is better to substitute 'tasks' in these cases with 'experience' or 'meaning'. The main aim of the CU approach is to

provide a frame for mapping interpretations of a given product or service when it is considered as an experiential whole, i.e. as circumstance and activity (use), a quality (usability), a practice (usage), and as a value (usefulness). Meanings are captured in language. In spoken conversation (such as in discussions of characteristics, attributes, features and functions, see below).

Table. 3.1 CAFFs from the user-consumer's and the firm's perceptions

	User-consumer perceptions	Firm's perceptions
Characteristics	What distinguishes the product from other products?	What distinguishes product from others in terms of design and production?
Attributes	What it will add symbolically to the home, the owner's self-image, what is its ability to be shown etc.?	Working titles for product, project titles. Degrees of difficulty, demands on expertise etc.
Features	What draws the user-consumer to the product above and beyond others manufacturers?	Which aspects are truly novel and worth accenting?
Functionalities	How it will perform in the home, how it will add to the existing capabilities of already acquired and available products?	How do its specifications compare with previous products, others in the range, competitors products and so forth?

These elements are viewed as culminating in the institution of a use process which occurs when technologies are apprehended, appropriated, appreciated and used over their lifecycle and within the lives and lifestyles of consumer-users. As such they bear direct relevance to attempts to unpack user-consumers holistic impressions of a technology. Used as a component of a larger macro level mapping process, such as sociotechnical constituencies it can suggest a channelling of use knowledge relevant to various parts of a larger sociotechnical constituency.

Text

The etymological basis for 'text' comes from the Latin *textre* - to weave. 'Text' commonly refers to "written or printed words and form of a literary work."[56] Within the social sciences, and under the influences of semiotics, texts and their 'reading'

[56] Longman Dictionary.

now refers to the interpretation of many diverse forms of phenomena and activities such as performance-based text, literary journalism, and narratives of the self amongst other phenomena (Denzin, 1997). The basis for this argument is that language, representation, description and interpretation is pivotal to building our explicit and private realties. Spradley (1979) for instance suggests that much of culture is encoded in linguistic form. And as Ricoeur (1977) noted, we begin to unpack the meaningfulness of lived experiences by presupposing that it is as purposeful as a written text. Like a literary text, a social action "constitutes a delineated pattern which has to be interpreted according to its inner connections." (p.322) It means that anything known to a person may be viewed as constituting a text, as any public knowledge of it must be rendered and represented in either words or actions. Indeed, Daniel Dennet (1987) called for a general theory of representation when he wrote that what is needed is nothing less than a completely general theory of representation. This would explain how words, thoughts, thinkers, pictures, computers, animals, sentences, mechanisms, states, functions, nerve impulses and formal models can be said to represent one thing or another.

Considered as textual phenomena, technologies could be said to be 'inscribed' with features, functions and attributes through which they are distinguished and characterised, read by those who use, sell, design and develop them. As Stephen Talbott (1997) suggests that every technology already embodies certain human choices. It expresses meanings and intentions. He suggests that a gun was designed to kill living organisms at a distance, which gives it an "essentially" different nature from a pair of binoculars. This is akin to what Joseph Weizenbaum pointed out when he suggests that there can be no "general-purpose" tools (Weisenbaum, 1976: p.37) They accrue throughout the processes of ideation, design, distribution, appropriator, consumption, use, and disposal. As text is to the written book, these characteristics are the crystallised, purposeful aspects of a given technology. For a technology, such as the Cambridge System, to be effective: ". . . there must be a fit between technology and task and between individual characteristics and the technology." (Hubona and Geitz, 1997) In order to be relevant, successful or 'fit' with an anticipated 'audience'

or environment the benefits of these characteristics need to be transmitted to, and understood by, those who will pay for them. But "all understanding is a product, in part, of the interpreter's [pre-]understanding." (Arnold and Fischer, 1994: p.57)

Research work in cognitive psychology and psycholinguistics has emphasised the creative activity of the reader. Cognitive psychologists explain the interpretative act of reading in terms of 'schema theory'. The notion of a 'schema' (plural 'schemata' or 'schemas') derives from the work of the British psychologist Sir Frederic Bartlett who in his classic work *Remembering* (1932), defined it as "an active organization of past reactions, or of past experiences." (Bartlett, 1932: p.54) Bartlett explained memory as a creative process of reconstruction making use of such schemas. According to contemporary schema theory, perception, comprehension, interpretation and memory are mediated by mental schemata - hierarchical structures (or 'frames') for organising knowledge. Hollenbeck and Slaby (1979); put this strongly when they speak of the way in which children learn to 'decode' experiences drawn from the televisual environment.

> "Children are growing up in an environment in which they must learn to organize experiences and emotional responses not only in relationship to the physical and social environment of the home, but also in relation to the omnipresent screen on which miniature people and animals talk, sing, dance and encourage the purchase of toys, candies and breakfast foods. . . [children] must learn not only to decode the verbal utterances of parents and friends or to establish schemata for the meaning of the smiles and frowns of adults around them, but they must also learn the special conventions of the television medium, its smaller than life frame, its appearances and disappearances of characters, intrusions of irrelevant commercials to otherwise engrossing story material, the meanings of zooms, fade-outs, miraculous superhero leaps, and flashbacks." (p.226)

Cognitive theorists place emphasis on the fact that for each new environment a subject encounters, they bring pre-established schemata based on previous experience and fantasised anticipations about what may be expected in a situation. Schemata have been built up over repeated interaction with a given environment as well as reflections upon the experiences of the interactions. Some schemata are more complex, more integrated or organised and differentiated than others. Plans or

anticipatory schemata are not only specific to situations, but involve a search and selection faculty, related to the kind of information to be processed or the kind of social setting one anticipates.

In an obvious act of constructing meaning Halasz (1988) sees that reading texts is a process in which the reader interprets information based on his/her pre-existing biases, expectations, and perceptions. Even the most mundane texts require the reader to go beyond that which is explicitly stated in order to make sense of them, though we are normally unaware of the extent of such interpretation in our everyday reading. Readers draw upon different repertoires of schemata, partly as a result of relatively enduring differences in background (i.e. experience and knowledge) and of relatively transitory differences in viewpoint (i.e. purposes). For experienced readers reading is a continual process of making inferences, evaluating the validity and significance of texts, relating them to prior experience, knowledge and viewpoint, and considering implications. Such psychological accounts do not suggest that a text means whatever a reader wants it to mean, but simply that readers must make active use of schemata to make sense of the text, and that different readers may employ different schemata and may vary in their interpretations. Reading is not passive 'information retrieval' and a text does not have a single, unchanging meaning.

Uses and gratifications

'Uses and gratifications research' (see McQuail and Windahl, 1993; Morley, 1992 or Curran, 1990) was an approach in media and communication studies which derived from functionalism. It builds from the idea that individuals are motivated to use media in various ways to meet particular needs, and from the assumption that individuals take an active role in the communication process and are essentially goal directed in their media behaviour. In other words they have specific 'uses' for media, gratified by consumption of certain content. It represented a fundamental shift from considering what media *does* to people, to what people *do* with media. (Halloran, 1970, McLeod *et al.*, 1991) Moreover, it suggests 'active' interpretation rather than 'passive' reception on behalf of audiences.

The crystallised purpose of a piece of written material, or the features and functions of a given technology "transgress all closure" as Johnson (1990: p.40) has it. They are always, as all mass produced products, open to some degree of re- or mis – interpretation regarding their 'use' or 'values'. What is interesting here is that 'interpretative flexibility' extends past the processes of development and the 'closure' of the final manufactured design. This challenges the position of some social constructivist commentators such as Bijker (1995). For him, product interpretation is solely a matter of identifying those (particularly interest groups) who shape the development of a technology towards 'closure' – i.e. the manufacture and production. There is little discussion of consumer-users' receptivity of the products, nor of their attempts to self-customise lacking designs. The truth is that regardless of the processes and confluence of development and production, no matter how many social groups influence its design (or come to that how many usability tests are conducted), the product may never come to be relevant or even registered in the consciousness of consumer-users at all:

> "The making of a film is not something to be discovered purely in the text itself, but is constituted in the interaction between the text and its users . . . The early claim of semiology to be able to account for a text's functioning through an immanent analysis was essentially misfounded in its failure to perceive that any textual system could only have meaning in relation to codes not purely textual, and that the recognition, distribution, and activation of these would vary socially and historically." (Hill, 1979: p.122; quoted in Morley, 1992: p.87)

Such a realisation was typical of the rising discontent in the 1970s with the uses and gratifications model (Elliot, 1974). Uses and gratifications, while emphasising the active reader of texts, presumed an overly-optimistic view of people being empowered to successfully find texts that fulfilled their purposes. It denied the fact that texts have 'preferred meanings' imputed or inscribed into them by their creators, instead it suggested that "no single 'correct' meaning can be conveyed by language and transmitted to all readers alike." (Stern, 1998: p.11)

Such thinking serves as the basis of Hall's (1980) *encoding/decoding* model of media

reception. Encoding/decoding theory emphasises the interactive qualities that take place between a text and its users. It was based on the realisation that mass communication is a structured activity, in which the institutions that produce media messages do have a power to set agendas, and to define issues. Rather than allowing a totally free range of interpretation possibilities on behalf of the media consumer (as does the uses and gratifications approach), it sees these possibilities tempered by the limitations in agenda setting and cultural categorisation set by the broadcasters.

The extent to which the reader is involved in constructing meaning depends partly on the kind of text involved. Indeed, considering the degree by which things are 'read', it seems that different types of 'text' are even capable, and even require quite different levels, styles and depths of 'reading'. Some texts are more 'open' than others. For instance, one would usually expect more active interpretation by the reader to be involved with a poem than with a telephone directory. David Olson has argued that in formal scientific and philosophical writing 'the meaning is in the text' rather than in its interpretation (Olson, 1977: p. 277), but (whilst some may indeed see this as a goal), textual meanings can never be severed from interpretation. In his widely-acclaimed book *S/Z*, Roland Barthes (1974) referred to two kinds of writing in terms of the extent to which they involve the reader - the 'readerly' (low reader involvement, lisible, 'consumer-focused' 'user-centred') and the 'writerly' (high reader involvement, scriptible, designer-focused – a strong example being 'designer objects', wonderful aesthetic design, but highly unusable).

Texts of the 'readerly' kind leave the reader 'with no more than the poor freedom either to accept or reject the text' (cited in Hawkes, 1977: p. 114) - they treat the writer as producer and the reader as submissive consumer and suggest their 'reflection' of 'the real world'. This is similar to what Roth (1987: p.47) suggests as the "ways writers actively construct their audiences," *creating* them as they compose. Texts of the writerly kind invite the active participation of the reader, and also, in their attention to linguistic mediation, an involvement in the construction of reality. Ironically, it is readerly texts which tend to be described as 'readable', whilst writerly

texts are often referred to as 'unreadable' because they require more effort. In passing, it is worth noting that the extension of Barthes's notion to other media could be productive, involving a consideration of the extent to which engagement with such media might be regarded as 'userly' or 'designerly'.

I may read a book for the purposes of instruction, I may read a book for entertainment and enjoyment. But do I read a 'technology' considered as a text in a similar way? Such a view may comprise of a description of not only the ostensible casing, buttons and graphical characteristics, but also the meanings which accompany, adorn and characterise it in the public consciousness. Television for instance has its 'double articulation' as a conveyer of messages and as a technological artefact (Williams, 1974; Silverstone, 1994). It may also represent the aspirations and identity of a particular culture (such as the BBC as a hallmark of British society), be a 'friendly' voice when one lacks company, be a childminder (the 'one-eyed babysitter'), and so forth. It provides then a range of tangible, or explicit messages, bound to a plethora of implicit, tacit meanings and uses.

Likewise other kinds of product and services often include visual cues and attributes such as those seen in advertising, which indicate something of the 'ideal' situation and circumstance under which the product is used, or associations and attributes advertisers see match or position the product (i.e. Barthes, 1972). And again published specifications and brochures and other 'grey literature' provide a quite different message. There are also the myths surrounding the product in a design department, recommendations of retail staff and friends and so forth. In other words, each product as a whole in the mind of the individual, is built from both intangible and tangible elements, and the explicit and implicit means by which it comes to be registered in consciousness.

Returning to readers and texts, the degree of a reader's involvement depends not only on the type of text and on how readerly or writerly it may be, but on *how* the text is used. Poetry is sometimes 'consulted' for biographical information and telephone

directories have occasionally been used as sources of 'found poetry'. At least with experienced readers, how a text is used is almost entirely up to the reader. Certainly, the reader's purposes are at least as important as the author's intentions. Whilst Swift's Gulliver's Travels may have been primarily intended as a satire, this does not stop children enjoying it purely as entertainment. MacKay (1995) notes this in relation to technology;

> "Most technologies never stabilise in the way so many sociology of technology accounts suggest . . . people are not merely malleable subjects who submit to the dictates of a technology; in their consumption they are not the passive dupes suggested by crude theorists of consumption, but active, creative and expressive subjects . . . they may refine a technology in a way that defies its original, designed and intended purpose."(p.44)

Very much like a media 'message', a technology cannot be entirely separated from the intentionality of the designer. Their intention is crystallised within the product by virtue of its features and functions which close certain options while raising others.

With the advent of computer technology within television production processes, there is a much wider palette of 'effects' that can add to or augment the experience of televisual texts. Such innovations not only transformed the creative process involved in the use of production techniques but also intensified what is presented to the viewer, and to some extent has developed and, in due course, extended the interpretative prowess of the viewer.

Morley (1992) explicates the operational premises on which Hall's encoding/decoding approach is based. Morley surmises these as:

- The same event can be encoded in more than one way.
- The message always contains more than one potential 'reading'.
- Understanding the message is also a problematic practice, however transparent and 'natural' it may seem.

Hall argues that there is a basic distinction to be made between the social processes that encode and decode media texts. Cultural forms may be said to be encoded through a historical mix of institutional relations, professional norms and technical

equipment. The audience, on the other hand, decodes using similar social structural relations, political and cultural dispositions as well as access to the relevant technology. At the centre of the encoding/decoding model is three decoding 'potentials' - *dominant (or preferred), negotiated* and *oppositional* - which suggest the logical possibilities of how the receiver shares, partly shares, or does not share the code in which the message is sent and therefore to that extent, being likely to make a dominant, negotiated or oppositional decoding.

In many senses Hall's theory may be re-interpreted substituting the production, transmission, reception, and interpretation of media programmes with the production, diffusion, appropriation, and consumption/use of a technology (such as suggested by Mackay, 1995). For instance Hall makes the point that there may be no direct fit between the encoding and decoding ends of the communication chain. This is directly analogous to the way in which technologies are produced which lack usability, or indeed lack utility, particularly within the lifestyle and expertise of certain groups of consumer-users over others. I have already presented examples of this earlier with respect to architectural design, but an example from product development arises in Ortt and Schoormas (1993) when they note the lack of fit which is often experienced between production of product attributes, and their interpretation by consumers;

> "In the ideal situation, physical characteristics are correctly perceived by consumers. Furthermore, it is assumed that all consumers can interpret the products' attributes and consequences the same way. However in practice consumers perceive products incorrectly. They often do not see attributes that are present in a product, and sometime they even see attributes that are not present at all." (p.378)

The encoding/decoding model offers a basic theoretical framework which may be used to investigate instances where certain technologies and their purposes integrate easily within the lives of its consumer-users (what Silverstone, 1995 refers to as becoming 'domesticated'). One can say this is akin to the 'preferred reading' of the technology and its CAFFs – characteristics, attributes, feature and functions. 'Negotiated readings' may be where technologies or particular CAFFs cause problems, or only partially integrate within consumer-users' lives. Perhaps it needs

constant attention, upgrading, or perhaps is of value for only a certain period of time (such as records, films, or games which have a limited interest period of intense use followed by a loss of interest and little or cessation of use). Negotiated readings, can also cast light on consumer-user adaptations with existing technologies - the way in which consumer-users may 'subvert' or innovate on the characteristics and functions of a produced technology (Westrum, 1991). Essentially this is where the consumer-user does not use them in the product designer's prescribed manner or 'designed' intention.[57] 'Oppositional readings' of a technology is where a person remains unaware or positively resists use, or particular characteristics and functionalities. Examples here are parents who intentionally avoid buying a games console due to beliefs regarding its influence on children's behaviour, or those who prefer not to read a manual and therefore miss out on more esoteric nevertheless useful functions, which are difficult to find through 'learning by using'.

Context

What is quite clear from the discussion so far is that texts, whether considered as 'messages' or as 'features and functions' rely on the large part on their contexts of use or interpretation. The etymological basis for context derives from the Latin *cum* (with) and *textre* (to weave) suggesting 'a weaving together'. Following the previous chapter, Fritjof Capra, (1996) suggests systems relate strongly to the notion of context:

> "... systems thinking is contextual thinking; and since explaining systems in terms of their context means explaining them in terms of their environment, we can also say that all systems thinking is environmental thinking." (Capra, 1996: p.37)

[57] " . . . an innovation is socially constructed along multiple dimensions which can be emphasised or de-emphasized by different users in different situations. In other words, different users will perceive and construct technologies that are nominally the same in different ways. There are few predetermined parameters to the technology but, rather, the design of the technology depends crucially on the social and psychological construction of the adopting organization. Thus, innovation is not a fixed entity but a malleable social construction. The degree to which innovation is successful in a given context is then seen as being determined by both the technology itself (its unique configuration) and the operational and organizational context into which it is being inserted. Given this, decisions made before implementation, about the design of the technology and organization, will be crucial to the outcome of implementation." (Newell, Swan, and Clark, 1993: p.34)

Typically, we think of contexts as frameworks or circumstances that enable us to infer or determine intention and meaning.

> "in semiotic terms, a text represents a coherent cluster of signifiers. A text signifies something when it becomes situated in a context for interpretations." (Lindlof, 1995: p.53)

No information is realised without context. Gregory Bateson (1980: p.24) is very direct when he defines the importance of context to meaning, behaviour and evolution;

> " . . . 'context' is linked to another undefined notion called 'meaning'. Without context, words and actions have no meaning at all. This is true not only of human communications in words but also of all communication whatsoever, of all mental process, of all mind, including that which tells the sea anemone how to grow and the amoeba what he should do next . . . I am asserting that whatever the word *context* means, it is an appropriate word, the *necessary* word, in the description of all these distantly related processes."

Returning to a biological analogy for a moment. Any given ecosystem, consisting of a number of species and a certain physical environment, will exhibit a great deal of mutual adaptation as the various species have co-evolved while constantly having effects on their surroundings. Over time, the "design" of each species becomes increasingly interlocked with the rest of the ecosystem, so that its structure becomes well-adapted to particular forms of interaction while contributing certain ongoing influences in turn. In this sense, the structures of the various species and their environments become "coupled" - implying one another through their mutual adaptation and their roles in creating the conditions of continued existence for one another. As a result, it makes little sense to study an organism in isolation from its environment. Simple descriptive anatomy might provide a useful source of reference material, but it will not provide concepts to explain how the organism functions in its natural surroundings or why it is structured as it is (Buller, 1999).

When one provides information, such as a written text or a set of functions or features, context provides the basis by which that information converts into knowledge or know-how (expertise). Text, functions and features crystallise through

design and production. Contexts guide use and usage styles and behaviours (as suggested in chapter 1, on the structuralisation of interactive experiences). But contexts are mutable, dynamic forces rather than static fixed terms or conditions within which a person designs, or a firm produces or what a text represents to someone (as are some media texts such as televisual material). As active acts of interpretation, they influence and shape; and are active whether they are historical or contemporary. But as previously discussed texts, features and functions also shape - and even transform - and do not simply represent. The philosophy of Wittgenstein for instance, suggests how language is dependent on use. John Seely Brown and Paul Duguid), in their book, *The Social Life of Information* (2000), put forward that writers and designers, "always face the challenge of what to leave to context, what to information." (p.200)

On a social level, an instance when the social, the technical and time are woven together is when contracts, and other mechanisms designed to crystallise social relations, are drawn. Regulatory structures and standards for instance, can act as an important cornerstone to functional relations between parties. However, through changing contexts, such as new innovation coming to the market and new competition, they can also become a bind, a hindrance, or act as a factor stifling innovation. Also, if the contexts written into, and described in the contract are not comprehensive and detailed enough, loopholes may appear benefiting one party over another.

Fish (1980) agrees for the fundamental importance of readers' interpretations of texts. But for him, a text is not a text without a reader and a context. He stressed meaning-making as a process, not as the 'extraction' of 'content', but he limited the possible range of readers' meanings by stressing the importance of 'interpretative communities'. This idea suggests that realities, readings, and meanings take place, and develop value, within social circumstances: "although reality is . . .socially constructed, it can then be objectified in constraining social structure." (Arnold and Fischer, 1994: p.59)

Different cultures, or 'interpretative communities' possess variations in what they consider amusing, as well as under which contexts and conditions things 'become' or are 'seen to be' amusing. "Through dialogue, the community collectively creates new understanding." (Ibid: p.57) McQuail (1994) sees that the media acts as a kind of mortar in the way we come to share understandings with others; "It is the media which are likely to forge the elements which are held in common with others, since we now tend to share much of the same media sources and 'media culture'." (p.64)

Beyond the realm of cognitive forms of context, Morley (1992) in his analysis of the audience takes the view that the context of viewing, i.e. the circumstances, conditions, situations and place of viewing is in every way as important as what is eventually viewed. To stress the point regarding the geographical dimensions of contextual influence he suggests the phenomenology of 'going to the pictures' is comprised of a diverse gestalt of elements, in which actually viewing and interpreting the film is only one. The queue, deco, architectural structures, smell, music, social contingencies, food, behaviours, protocols, light, comfort of the seat, all contribute in forming the experience of 'going to the pictures'.

This is important as it draws attention to the fact that all practices and activities have contexts that both enable and constrain them. In the previous chapter, I referred to the meshing of complex social and technical elements in the creation of a 'whole' network, constituency, configuration or system of co-shaping social and technical elements. Such systems include sub-systems of innovation and learning, systems of mapping, understanding and feedback, systems of action and iteration. From the analysis of actor-networks or sociotechnical constituencies the final design product which finally emerges to populate and engage the market can be clearly understood as a product of many diffuse forces and tensions. But beyond the confidence of these frames of analysis, the complexity of such processes blur control, and any attempts at simple reasoning on behalf of managers and practitioners as to why some products are successful whilst others are not (Rycroft and Kash, 1999).

Nevertheless, one reasonably consistent determinant of the success of high-tech products is cited as their *usability* - the design of 'ease', 'effectiveness', 'efficiency' and 'satisfaction' of use. This is perhaps best understood using a Darwinian metaphor – the notion of 'fit'. 'Fit' as applied to the instance of products or services, is when their intended function and purpose matches that of their apprehended function and purpose, to the delight of those who will be willing to pay for it. Usability as a quality plays a significant role in this process of fit, as frustrations on the part of those who use arise from disparities of anticipated function from actualised function, or from poor representation of function in visible elements of its design, or even through marketing, advertising and promotional activity.

To design usability effectively represents a real challenge to designers, particularly if they have no concept or information regarding the *contexts* of use - how the product is encountered, apprehended, interpreted and used by users.

And again, as suggested earlier, a focus on purely functional dimensions of a product is no guarantee of 'fit'. Intangible and tacit elements can contribute to its apprehension in the minds of those that use and consume. Usability as either aim or experience can be said to only really exist as both a product *of* contexts, and as a product which can only be apprehended *within* contexts - technological, informational, historical, social, and individual. Most importantly it is both created and apprehended also through practice – i.e. use and usage - *expertise*. It also relies on the substance of the communication act itself, whether this means the features, functions, texts or symbols denoting the designer's and producer's intended purpose/s.

From a usability perspective it is the users' perception of product qualities which is important, and it is these which need to be captured and translated to designers and managers in meaningful ways, in order to produce relevant feedback into innovation effort. Beyond simply imaginative or speculative views of potential needs and requirements regarding a product, lie perceptions of use, consumption and users

informed through various kinds of research practice. Research practice is the means by which users and consumers are themselves 'designed' by firms, either as an "ideal" or "necessary" to "complete both the function and vision embodied in the artefact." (Silverstone and Haddon, 1996: p.45) This can often act to problematise the notion of user value and behaviours for guiding early ideation and design, it can also be used politically within the firm to win senior managerial support for projects, or even in validating the prospect of new innovations to the wider public domain (Nicoll, 1999a).

Usability

My original role in the study of the Cambridge trial was to evaluate the *usability* of the Cambridge system. Usability is an art and science that goes by a number of different names; usability engineering, user-centred design, human factors engineering, human factors, engineering psychology, and ergonomics (Wiklund, 1994). As *an experiential* aspect of a product usability has been defined as:

- The ease with which a user can learn to operate, prepare inputs for, and interpret outputs of a system or component.[59]
- The effectiveness, efficiency and satisfaction with which a specified set of users can achieve a specified set of tasks in particular environments.[60]

Usability has also emerged as a distinctive *set of techniques* originating from what is more generally termed as the field of *human-computer interaction* (HCI) - an "area of intersection between applied psychology and the social sciences . . . and computer science and technologies" (Carroll, 1997); and *ergonomics* – which is described as a: "study of work, and its environment and conditions in order to achieve maximum efficiency."[61]

These have largely focused upon *human factors* - human cognitive and physical

[59] Institute of Electrical and Electronics Engineers (1990) *IEEE Standard Computer Dictionary: A Compilation of IEEE* Standard Computer Glossaries

[60] ISO (1991). International Standard ISO/IEC 9126. Information technology - Software product evaluation - Quality characteristics and guidelines for their use, International Organization for Standardization, International Electrotechnical Commission, Geneva.

capacities and limitations relative to the design and specifications of task, technology and machinery. Part of the product of this research has been translated into guidelines and prescriptive measures regarding the size, positioning and other characteristics of hardware and display items. The goal of HCI, or Human Factors research is "to ensure that the systems produced by designers for people to use are comprehensible, consistent and usable." (Maddix, 1990: p.9) The means by which usability and other HCI studies achieve this is a focus on users. Carroll sees a pivotal point in the early development of HCI as emerging in the work of Dreyfus (1979) who shifted the focus in design practice "beyond the designer's need for prototyping and iteration as a means to clarifying the design problem . . . to the user's knowledge, experience and involvement to constrain design solutions." (Carroll, 1997: p.504)

This is the genesis of what is referred to as *user-centred* design. However it would be erroneous to suggest that this became a prevailing view since the late 50s, as much of the writing on computing from the mid-70s were: "stunningly dismissive of usability and rather patronizing of users." (Carroll: p.506) This was not confined to computer system design in the field of architecture a similar notion was that: "people are infinitely adaptable, that they will respond in the way that they will give up normal tendencies to personalize the spaces in which they work." (Lang, *et al.* 1974) There is an in-built tendency for people to subvert overly rational structures put upon them. Customising, making something one's own, or altering it in some way so that it functions better is not just a common practice, but an *essential* practice in helping products evolve and achieve success.[61] Von Hippel (1978) has come to realise its

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[61] Skinning refers to a current practice for firms and individuals to develop novel interfaces for certain applications on a PC. One can change the look and feel of a browser by adding another 'skin'. Advertising is getting involved with this practice so one could technically have a skin which advertises a product:

> "The urge that leads people to populate their bookshelves with action figures and their refrigerators with magnets manifests on the desktop as a drive to customize . . . Functionally, PCs are typewriters, banks, meeting rooms. The homogeneity that turned them into consumer products has outlived its usefulness."

It has opened some debate, interestingly enough with respect to usability. Jeff Raskin, an Apple interface designer, suggests that it was the standardised user interface, that "liberated computing and delivered it to the people." "If users are embracing customization", he says, "it's only because they're hungry for something better." He feels that skinners, "revel in hyper-personalization for its own sake." Damian Hodgkiss, a 'skinner' counters: "Who's to say there's only one definition of usable? Why shouldn't there be many?" They recognises that complexity, leads to discovery, and consequently to a

occurrence within industrial settings as a real opportunity for firms to learn from users how to improve their products. But to capture such user innovation requires a particular organisational capacity and a certain receptivity and openness that not all firms can afford. The depth of user innovativeness is also something of note here. There is an even more core process of discovery and shaping that users perform in realising the use, usefulness and defining characteristics of technologies and their relation to service.

The telephone is a good example. Bell's original patent idea was for a telegraphy device, but the first real *application* was developed by Charles Williams Jr. connecting his home to his factory. Also in April 1877, was the first instance of the telephone being used for news reporting - one of Bell's lectures was transmitted from Salem to the *Boston Globe*. Martin (1991) also indicates that the central office telephone exchange in Boston connected a local drug store with twenty-one local doctors, and how the proprietor of a burglar alarm system installed telephones so his customers could summon messengers and express services. Martin also gives a vivid account of diverse explorations of use by firms and network operators.[62]

Usability should reduce the learning curve involved with using, as well as allowing more functionality with less effort. Most importantly it helps in avoiding expensive late fixes and design afterthoughts. By involving naive users early, such as at the prototype stage, problems can be rapidly realised and addressed before 'closing' the final design for manufacturing and production. Realising problems after this time, such as when the product is retailed and/or reviewed may be very expensive, indeed impossible, to change.

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more involving experience." (source: http://www.wired.com/wired/archive/8.10/skins.html)

[62] Most importantly she notes the distinction between 'rational' business uses, and 'rational' domestic use. The latter perceived as being the connection of the businessman with his home, and his wife to her suppliers. However, she cites numerous other examples of services which came to be presented over the telephone such as entertainment, information (with operators giving out football scores and addresses) and advertising (storekeepers phoning people unsolicited). Perhaps most fascinating of all is the way in which the phone could "bring god to the sick and elderly" through preachers giving sermons on the phone (p.136). This gave raise to a moral question at the time: "was a religious service over telephone as sacred as one at church?" The spectre of 'virtualization' was clearly raised even then. Are these the precursors of on-line services?

Failure to capture users

As cited earlier that Preece (1993) suggested that many system designers regarded users as adapting to use of a system, 'like a cog in a machine'. Her suggestion is of a strong determinism or presumption on behalf of designers.

Commentators such as Donald Norman (i.e. 1988) have forced the point that *well-designed* objects are easy to interpret, understand, and use because they contain manifest cues for use (i.e. visual contextual data, highly representational of function). On the other hand *poorly-designed* objects are difficult to interpret, understand, and use because they provide false cues, sometimes misleading cues to trap the user and thwart the normal process of interpreting and understanding (poor contextual data, not representational of function). Norman refers here to design and usability with respect to visual interfaces, and anyone who has used computers most likely has many stories of dysfunction accompanied by misleading or cryptic messages or symbols. While these may mean something to designers or experts, this meaning will be lost on novice or naïve users. These are cases of design which are overly-presumptive of the knowledge and interpretative capacities of users, or even tantamount to acts of active exclusion (Woolgar, 1991)

To be truly user-centred usability has expanded the remit of HCI and ergonomics to encompass the *cognitive* and *emotional* aspects of using products. More recently, usability research has expanded the scope of HCI and ergonomics research to include emotional, perceptual and social aspects of use - aspects which have conventionally come under the wider auspices of the social sciences as foci of study (March, 1994; Logan, 1994). Identifying the emotional dimensions of products help develop the product as a societal innovation (Cove and Svanfeldt, 1993), rather than an innovation pertaining to certain market segments. It helps create a product that represents the emotional link between this trend and the culture of the company (Tharp and Scott, 1990).

The prospect of design practice completely removed from any active awareness on behalf of the user is accented in the emergence of interactive and intelligent products. Here there is much more room for assumption of use and utility in design than in the design of more 'orthodox' products - even interactive interfaces. Such products may have few, if any, ostensible features or functional controls, depending absolutely in their melding into the contexts and individual circumstances of use, in a way which is totally congruent with the behaviours and goals of its users (for a taxonomy of such products see Nicoll, 1998). Put simply, they may work best *only* when they are unnoticed, sublimated into the environments and contexts of use. Many design features of such artefacts and technologies can only be fully appreciated, critiqued or evaluated when *en situ* - i.e. integrated as part of a system (where they may be a component), or operating as something which is used in a non-conscious, taken for granted way (such as a door, tools, or medium).

Extending to this 'new paradigm' approach to understanding the usability of products, are views that usability should be treated as much more a situated quality within the overall experience of the consumer-user of a product – i.e. to view usability arising from a complex of elements which constitute, motivate and constrain use and consumption.[63] This now suggests a second contextual dimension which views how, as a perceivable quality, usability cannot be isolated from (and in fact may be dependent upon) other symbolic and functional attributes of the product. It attempts to understand the dynamic space between user and product, and translate users' understanding into the product's form (March, 1994). Cooper and Press (1995) observe that recent Japanese design practice has manifested a very explicit attempt to address the blending of symbolic and functional attributes into design practice:

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[63] Suchman (1988) explores the situated learning framework in the context of artificial intelligence. Lave (1988) argues that learning as it normally occurs is a function of the activity, context and culture in which it occurs (i.e., it is situated). This contrasts with most classroom learning activities which involve knowledge which is abstract and out of context. Social interaction is a critical component of situated learning – learners become involved in a "community of practice" which embodies certain beliefs and behaviours to be acquired. As the beginner or newcomer moves from the periphery of this community to its centre, they become more active and engaged within the culture and hence assume the role of expert or old-timer. Furthermore, situated learning is usually unintentional rather than deliberate. Situated learning has antecedents in the work of Gibson (1977) (theory of affordances) and Vygotsky (1978) (social learning).

> "Japanese manufacturers are using the term "humanware" to describe design which injects lifestyle into products and bases differentiation more upon image and user requirements rather than function . . ."(p.10)

Humanware is regarded by consumer electronic firm Sharp as the consideration and design of products in terms of the total environment in which they will be used (Thackara, 1988). The suggestion here of a design approach, intentionally infusing products with symbolic as well as functional attributes, demands new sensitivities on the part of designers and producers towards potential and actual use contingencies and outcomes. Some recent examples of such methods and practice are techniques such as *sensory engineering* - a holistic approach to design that accounts for subliminal as well as emotional aspects of the product. For instance The Mazda Corporation has recently employed this approach in car design, where the design of cars is focused on the six human senses.[64] Their object is to " . . . develop cars which will appeal to the sixth sense, intuition, which is the most important for selling cars." (Tatsuno, 1993) The prevalent attitude here is one of the 'sum of the parts is greater than the whole' – in that design which caters for the five senses will invoke responses on the intuitive level. Pine and Gilmore (1999) have described the 'experience economy' which refers to the differentiation of products through the design of memorable experiences. Cooper and Press (1995: p.152) view that understanding the consumer at such deep levels is a question of 'getting into their head':

> ". . . in order that they develop a conscious and subconscious understanding of consumer needs, and translate that understanding into design features. . . economic, cultural and occupational factors, peer group pressure, lifestyle and psychological factors are all relevant. These need to be collected and communicated in sensory terms to the designer."

In a very real sense smart products relate to networked-based devices such as the Internet and interactive television in that usability of the networked devices or services could be expanded to incorporate what is termed as 'back-office' activities. Substituting 'intelligent functioning' for the various processing and shifting of physical goods which make a transaction and its subsequent fulfilment possible, it is

[64] Sensitivity towards a human-centred design in cars has been recently highlighted through various manufacturers' advertising campaigns drawing attention to the science or creative aspects of design. One even emphasises this directly through promoting the statement "first man, then machine."

possible to begin to consider the social and technical dimensions of such systems as a whole.

This is a real issue with respect to current views of Internet e-commerce sales, where a site (or 'dot.com' firm) is valued over its entire set of representational, usability *and* fulfilment features. For instance this may includes how good looking aesthetically the site is; how 'sticky' it is (i.e. how long people are drawn by its content and function to remain with it); how easy it is to navigate between its pages; how easy it is to locate certain items; how easy it is to order them; and how long any order takes to arrive at a person's home. In a sense beyond aesthetics or any intrinsic value, effectiveness of a site depends largely on dimensions of time. 'Short-cut' features such as Amazon.com's 'one-click' purchase mechanism, reduces the series of heuristics that a user must step through to complete their transactions, and so brings the focus back to the object of the visit – i.e. the goods - rather then the mechanisms and operational idiosyncrasies of the site's technical and navigational design.

Design of experience, innovation in use and consumption

Some commentators (i.e. Firat *et al.*, 1995) now view reversal in the roles of production and consumption as a distinguishing feature of recent society and its economy. From this view production loses its privileged status in culture to consumption, which has become the means by which individuals define their self-images for themselves as well as others.[65] Kanter (1992: p.9) for instance states that: "the information age discredits another Industrial Age principle articulated by Karl Marx. Power stems not from control of the means of production but from influence over the means of consumption." Firms, their products, and intelligence are penetrating what was previously tacit, hidden and private. And they are doing this ever more pervasively in homes, and also in the lives and lifestyles of consumers.

[65] Jean Baudrillard suggests that consumption is increasingly becoming a productive process, goal-orientated, and purposeful, it requires that individuals be educated to carry out this process, it requires special skills. (Baudrillard, 1988)

Due to this 'turn' it is becoming necessary for firms to 'get closer' to those they provided goods and services to in order to capitalise upon their idiosyncrasies as consumers (i.e. through personalisation or customisation), and also to understand more fully what constitutes the notion of fulfilling or satisfying *experiences* for them. This entails both the experience of accessing and acquiring goods and services (consuming), and learning of the experience of using the goods and services themselves. In their attempt to establish a new foundation for design Winograd and Flores (1986) state that:

> "In order to understand the phenomena related to a new technology we must ask about its design – the interaction between understanding and creating . . . We address the broader question of how society engenders inventions whose existence in turn alters that society. We to establish a theoretical basis for looking at what devices do, not just how they operate." (p.4)

By populating domestic and mobile personal space by interactive communication devices such as i-Tv and mobile communications, essentially increases the information intensity arising from the relation between producers and consumers. For designers and producers such technologies provide, using the correct applied understanding, an entirely unique insight into what people are doing when they take part in activities. Using these technologies they may now attempt to understand and meet the 'on-demand' needs of a self-directed individualist consumer and capitalise upon their drives for self-[re-]creation. Each technology – i-Tv, mobile phone, smart card, credit card -can essentially act as a 'lens' providing a glimpse into behaviour, and sometimes attitude, one which is nevertheless coloured by the interaction potentials of that particular technology. But as explored at length earlier, the feedback between [pre-existing] activities done through new technological means, reflexively changes the nature of these activities. Convergence may now be taken to mean computing, communications, consumer research and fulfilment collapsing as *techniques*, and combining in technologies that become ever more closely melded with human experience and perception. This opens the new imperative for technology studies and research to study this reflexivity, between shifting structures and boundaries and shifting activities.[66]

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[66] This was similar to the problems experienced in researching the Cambridge Trial itself. The

It is clear that it is simply not enough to consider 'interaction' as symptomatic only of the recent explosion in 'interactive media'. An example of this is offered by Pelly (1996: p.23) who sees that a car; "is a design whose function blends everything from technology to sensuous touch, a product that thrives on sound and light, as well as on what is seen and felt, an experience that bridges the past and the future."

Many products and services provide *or require* an experiential framework - participating, viewing, reading - that fosters a change processes within each person (Pine and Gilmore, 1999). The product or service merely provides the arena for the inner experience, resulting in a change in the person's inner state (more motivated, clearer about goals, happier, etc.) In experiential design, it is this experience that is offered to the market - and it is the experience, not the product or service, that really meets the needs of the consumer-user. It must rather be considered from its basis in cultivating human consciousness, culture and society, both from an evolutionary as well as developmental perspective. The role of interaction must also be understood in the design and development of what is best described as 'static' products, symbols and artefacts. And then how it considers how it features in the design and development of dynamic products and artefacts.[67]

For the near future, the biggest design challenge lies in developing systems that can account for idiosyncrasies of use, idiosyncrasies of taste, idiosyncrasies of needs (Araya, 1995, Kelly, 1995; Kurzweil, 1999).[68] In many respects it would appear that it is our essential and defining human qualities, and particularly those needs which lie

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[67] Static products are probably best represented by tools, which rely on a relatively stable functionality. Graphic art and packaging, and ornaments best represent static symbols and artefacts. One could class 'smart' or 'intelligent' products as dynamic artefacts and television programmes and Internet web pages as dynamic products and symbols. As Fiske (1991: p.58) has it:

> "In one hour's television viewing, one of us is likely to experience more images than a member of a non-industrial society would in a lifetime. The quantitative difference is so great as to become categorical: we do not just experience more images, but we live with a completely different relationship between the image and other orders of experience. In fact, we live in a postmodern period when there is no difference between the image and other orders of experience."

[68] "The challenge for the next decade is not just to give people bigger screens, better sound quality and easier to use graphical input devices. It is to make computers that know you, learn about your needs and understand verbal and non-verbal languages." Editorial - *Inside Multimedia IM*, No 95, June 12, 1995

at the foot of the hierarchy of needs - the ancient and basic human needs - that will deny the logic and notion of 'perfect provision' by design, intelligent systems, networks and electronic means. Human unpredictability is the chaos that upsets any notion of overly rational approaches to planning and design. It is always the loose cannon for those who wish to force, manage or order the behaviour and minds of others.

Drawing the components of the use process together

The object of the discussion so far has been to show that by considering technologies, and in particular their features and functions crystallised as texts, contexts may come to be highlighted that otherwise would remain hidden or tacit. The production and diffusion of features and functions, considered as acts of communication between designers and users, can highlight disparities in their perceptions of products. This may provide clues as to the reason why some technologies come to be unsuccessful, whilst still manifesting strong competitive qualities such as competitive pricing or good usability.

Conversely, in studies of the user-consumer, investigation of their interpretation of technologies, their features and functions, highlight how varied are the kind of attributes associated with technologies and the ways by which the technologies come to be characterised. Such a view is useful indeed, as it is suggestive of the kind of epistemological symmetry applied in studies in the Sociology of Scientific Knowledge (Bloor, 1976). It denies privileging any form of determinist notions (technological, economical, or social) or any 'truth claims' regarding what a technology 'is', 'does' or 'can be'. Moreover, it denies simplistic cause and effect notions such as the 'effects of media and technologies on individuals and society'.

I would argue however, that there are certain essential and phenomenological qualities that define experience of use in every case of apprehension, whether considered from the perspectives of designer-producers or that of consumer-users. For instance, beyond a product's *usability* - how easy it is to operate and understand a

technology or service - there clearly exists a number of other properties and contingencies which significantly contribute to how and what a product 'is'. These properties are the culmination of actual encounters with the design product, its features and functions, in some manifest state, or as a result of some other kind of discourse such as advertising, discussion, imagination, predication and so forth. CU[69] proposes that the use process may be decomposed into four main dimensions that include:

- The individual circumstances and situations of ***use*** – the phenomenological, socio-cultural, economic, individual, sensory and psychological contexts which lead, motivate and otherwise create the *particular* and *individual* conditions of use. (i.e. retail shop floor, at home, during a birthday party etc.) (i.e. Belk, 1975).[70]
- ***usability*** – the ease of use of a device, service, product for novice and advanced users alike
- ***usage*** - contexts - social, cultural, technical, other interests, pursuits and activities etc. - which *pattern*, *constrain* and *sustain* periodic use or consumption.
- ***usefulness*** - the value gained from integration of the technology within an individual's lifestyle and activities. The quality of usefulness is again contingent on multiple contexts including user's relations with existing and previously possessed products (i.e. Dickerson and Gentry, 1983), the private

[69]I have termed this approach 'contextual usability' although it could equally be called 'contextual use'; 'contextual usefulness'; or "contextual usage". 'Contextual usability' does emphasise however that the other elements of the use process come to bear in the creation or impression of usability – the ease or 'fit' of use. In a sense their anticipated or actualised realisation are imperative precursors for usability to be a desirable and necessary quality of a technology (i.e. marketing claims of good usability are rarely used to sell product, whereas a promise of usefulness might). Also, usability is the single element in the use process that can be contrived by designers and producers. The others, while being suggested by marketing and advertising, are more 'open' texts, capable of engendering a range of impressions and beliefs regarding the product's ability to add value to current and future activities. Usability has to be realised and verified by consumer-users in the lived processes of apprehension, consumption and use.

[70] Belk (1975: p.157) considers that "situations and behavioural settings are subunits within an environment . . . Situations represent momentary encounters with those elements of the total environment which are available at a particular time. *Behavioural settings* - derived from Barker (1968) - are not only bounded in time and space but also a complete sequence of behaviour or an "action pattern." Examples Belk offers are a basketball game, or a piano lesson. These are behavioural settings since each involves an interval in time and space in which certain behaviours can be expected regardless of the particular persons present. The study of use also focuses more on the experiential qualities of use – from the perception of the consumer-user - in a particular situation, environment and circumstance. This may included how they view these situations, environments and experiences. The key difference here between use and usage lies in the difference between "momentary" use situations and environments, and periodic patterning of use in time and space (usage). Whereas, the quality of use may include elements which are obvious to the consumer-user, usage focuses much more upon behavioural variables, often not registered by the conscious awareness of the consumer-user. Also particular situations, environments and circumstances may promote or abate periodic use and consumption.

and public meaning of the product to the user, novelty, conspicuous benefits from using, etc.

I define these as essential distinguishing elements underlying either motivations to design, use or consume technology (see below).[71]

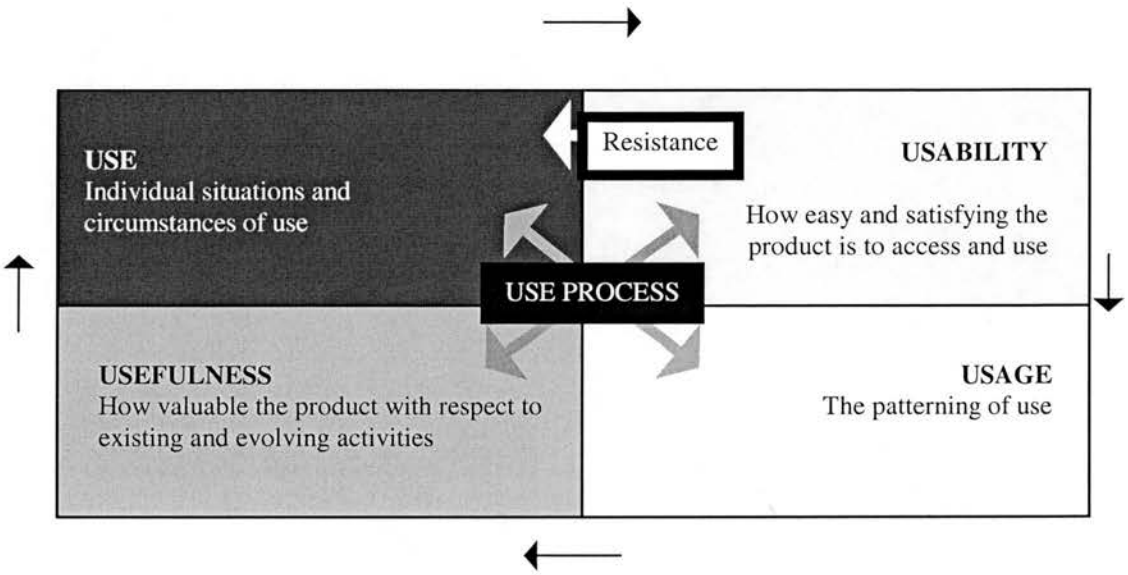

Fig. 3.1 The elements of the use process (arrows suggest interdependency of use elements, arrows circumnavigating suggest procedure of use, from first use to establishment of use. Usability of the technology *resists* use)[72]

The model shown above suggests an argument that the qualities of a technology or product, such as its usability co-exist with, or are, co-dependent upon the other aspects of the use process. For instance there is an obvious common-sense link between the usefulness of a product and the development of usage or consumption patterns.

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[71] It is also important to note that other use terms such as 'useless', 'abuse', 'used' and so on also have unique bearing and meaning at the level of analysis as represented here. However, I do not consider them here.

[72] Usability of a technology resists use within a number of different use situations. The novice user, for instance, using a new machine on the shop floor, may encounter problems accessing and operating. This obviously impacts upon their developing notions of the machine's usefulness, as well as their anticipations of how the machine can integrate into their lives. The 'expert' user, who has successfully incorporated the machine into everyday life, may similarly derive dissatisfaction if the machine does nor permit sufficient customisation which allows for their increased expertise in using - i.e. 'hot' buttons which allow for faster accessing of functions or content. Each of these represents a problem of the machine's usability.

There are also strong links between usefulness and usability, when one considers early spreadsheet packages. These had notoriously poor usability and were difficult to operate. However their utility and perceived value encouraged early users to overcome the problems of usability. Usability - the ease of use of products - cannot be divided from desire to use, reasons to use, and the socio-economic contexts and conditions of use (see table 3.2 below). This is particularly true in the use of media devices that are intended for recreational and informational purposes, consumed within the home and used within people's leisure time.

Table 3.2 The use process

Use process	Properties	How Captured	Illustrates
Use	Individuated use situations	From the perception of the consumer-user, observable behaviours, biographies	Situations, contexts and environments leading to use, demographics, psychographics, goals desires, needs and requirements
Usability	Ease of use	From the perception of the user-consumer	Attitudes towards technology Expertise of using technologies generally Problem solving style
Usage	Patterned or periodic use	Registration of the system	Social factors – i.e. regimes and rules regarding consumption and use in particular household Economic factors – i.e. cost of using Consequences of using
Usefulness	Relation to lifestyle and activities outside usage	Registration of the system and perceptions of the consumer-user	Relation of the technology to other pursuits, interests and tasks, outside of use Pleasure deriving from intrinsic motivation to use Consequences and outcomes of using Symbolic 'potency' of the technology

Use

Technologies and their use are not completely open affairs but are constrained by various physical, social and cognitive exigencies. Wittgenstein (1953) goes on to

show how language *use*, not some rigid set of rules, determines meaning. Nevertheless, many continue to search for the vacuum bottle ideal for language: "We think it [the ideal] must be in reality; for we think we already see it there." (p.101) In a similar way, we cannot specify the pure, or ideal, case for the use of an innovation, only its idealisation in the minds of the developers. Users inevitably interpret an innovation in their own distinctive ways, applying it idiosyncratically to their own contexts, and even re-create it to satisfy their own needs.

Donald Norman (1991; 1992, p.19-25) for instance speaks of 'affordances'. These are crystallised, inflexible (physical, ergonomic *and* interpretative) properties of objects. A table *affords* placing objects on it. A baseball *affords* throwing but does not afford sitting on. Spoons afford eating soup. So the blind man's 'reading' of the world is intricately tied to the affordance of his stick. We can talk of these properties of artefacts that extend our minds as affordances. Within the realm of affordances, I argue lie the characteristics, attributes, features and functions that relate to - and shape - our intentions and our social and cultural dispositions. Michael Cole (1991) recounts experiments in which adults bounce infants dressed in blue diapers but treat infants in pink diapers gently. Here the cultural expectations of the parents are already putting constraints on the child's future experience of the world.

Among the factors found to have a significant impact on technology use or implementation are the perceived usefulness of the innovation, individual innovativeness, and training, (i.e. Alavi & Joachimsthaler, 1992; Davis, 1989; Leonard Barton & Deschamps, 1988; Schiffman *et al.*, 1992). In a study of the relationship of attitudes and usage, Grantham and Vaske (1985) examined attitudes toward voice mail and extent of use. The researchers concluded that individuals' attitudes toward the voice mail system was the strongest predictor of extent of use and explained more of the variance than any of the other independent variables. In a study of the implementation of an intelligent telephone system, attitudes such as ease of use, the status attributed to using the new phones, and the complexity of systems features were not significantly correlated with extent of use (Manross & Rice, 1986).

Questioning or analysis (of transcribed text) here would be in the form: Who [uses], what [service], why [for which reason], and where [public or private use]? The investigation could be concerned with establishing which household member uses the system, what they use, for what purpose, and where within the home is it used. Put simply use unpacks into the following lines of exploration/questioning:

Who?

This would focus on the individual characteristics and socio-biographical details of the individual who comes to use the technology, product service etc. It may also contain demographical or psychographical information. Further it may seek to identify traits of the social group to which the individual belongs.

What?

Not only are current on-line services dominated by males, there has also been the prominence of some services over others (i.e. sexual bulletin boards). Also, following *who* uses, *what* type of person is attracted to interact with media and information? As an example Ann Gray (1987) has shown that women often will hire videotapes for family use, but rarely do for their own pleasure. How will this translate through the availability of video on demand (VOD - the ability to order videos on-line)? There is currently a predominance of male subscribers to the current Internet services, could this show a gender predication for generally interacting with media and information? Other demo- and psycho-graphic indicators may also feature here, the question being who may be attracted to use, what [service]?

Why?

Why is, or why would a person be drawn to use? What situations gave rise, or give rise to use? Not only is this a major marketing question (concerning for instance, a person's initial impetus to purchase), but one which concerns household and family social dynamics. How would certain household members communicate and 'sell' the idea to the others? How would anticipated benefits compare with actual use of the system, from an early-adopter (the advocate of the system, and the one who 'sells' it) and a technologically-reticent person's (i.e. a household member who had to be 'sold' the idea of acquiring a system) perspective.

Where?

This concerns geography and physical situation. Currently, where in the house are media technologies situated. Which are in the public spaces (i.e. the living room); and which are situated in private spaces (i.e. in a bedroom, or workroom). Domestic research (i.e. Silverstone and Hirsch, 1992) has illustrated that within households there may be more than one unit of a particular media technology in a household. Not only is this relevant to assessing individual household members media consumption (i.e. usage

patterns), but where the media technology is situated may also indicate something of the particular modalities of operation, as well as particular tastes and preferences for particular services.

By no means exhaustive my intention here is to suggest something of the complex nature of this one particular dimension, before moving to the other major use process comments. Use, although very dependent upon context, is also dependent upon *situation* and *circumstance*. Stanley Fish (1979: p.251) argues that we "are never not in a situation." Because of this we are "never not in the act of interpretation." Use is always situated, and therefore always a matter of interpretation (or *interaction*).

Usability

Here usability relates more specifically to how easy the product is to use from the consumer's perspective, both in terms of initial confrontation with the product (*immediate accessibility i.e. point of sale*), as well as sustained and continued use over time (*sustained usefulness i.e. after domestication).* Immediate accessibility of the system may be seriously hindered or 'resisted' by bad usability, thus giving rise to lack of 'attractiveness' to the consumer. However, the constituents of immediate accessibility and attractiveness, may be quite different factors from those contributing to sustained usefulness. A striking graphical or audio effect, may encourage and impress the consumer on the retail store floor, however it may jar the nerves, even annoy the persistent user.[73] According to Knowles (1988), any technique to evaluate usability is itself not very useful if it has to be restricted to a limited type of task environment. The laboratory is a very limited type of task environments, although usually designed to be very convenient for the purposes of experimentation. Is a laboratory-defined construct truly applicable in the real world and will it find the most important aspects of system usability?

Usage

It has been suggested by a number of studies that individuals' attitudes toward the usefulness of an information system are positively associated with its extent of use (Davis, 1989; Grantham & Vaske, 1985). Davis (1989) suggests that *usage* - the

[73] As indeed was evidenced in the case outlined later.

time user spends with the system - can be used as a surrogate for usability. The inference is that the more time a user spends with a system, the more usable he or she finds it. There are several flaws in this way of thinking. For instance, the system may be so complicated that the user has difficulties in getting any results and consequently spends time in vain, or the system usage may be obligatory in some sense. Actually, even the usage time is somewhat vaguely defined in the study, since its measuring is up to those who respond to the questionnaires. Davis suggests that according to the regression data, ease of use may actually be a causal antecedent of perceived usefulness, and not a direct determinant of system usage.

The research setting described above poses also another question. How could a user gain any perception of a computer system without first using it? If a motivated user tries to learn a computer system, initial difficulties encountered in the system will not hinder him or her from utilising it. A partial answer to the rhetorical question posed above is presented in Nielsen *et al.* (1986): a user views a system as approachable or unapproachable, depending on the amount of learning needed before the system is usable. All the factors affecting approachability are not known, but e.g. the size of the manual matters. Clearly, approachability would have to be included in the analysis of factors affecting perceived usability.

Most researchers who have studied the factors associated with successful technology implementation frequently quantify implementation by the amount of use, such as how many times per day or per week the technology is being used. Yet such quantification may not be an accurate measure of the quality of the implementation since the amount of use does not indicate whether the technology is being used to its fullest potential (Hiltz & Johnson, 1989; Rice & Case, 1983; Rice & Shook, 1990). Findings from studies that hypothesise about factors influencing technology implementation may lead to an incomplete view of implementation. This is especially true when amount of time or frequency of use is the sole measure of implementation because this quantification does not indicate whether individuals are taking advantage of the technology's potential (Rogers, 1995; Stewart, 1992). This is the patterning and formation of habits concerning use [who, and at what times]. While

usage and use are linked, usage is differentiated from use through its dependence on the social conditions and contexts affecting use. For instance; is there a family censoring policy? How does it effect the individual household members? Does the system interfere with the use of other media? Does it interfere with other leisure time activities? Does the household agree on dividing usage time? Usage forms an important aspect for study concerning the consumption of services. Parallel examples may be product 'shelf-life' or the playability life of a computer game or top twenty single. There are only so many times a person may play a game or a record. It is anticipated that some i-Tv services will change while others will be a more permanent feature.

Usefulness

Usefulness as used here has two facets: The first is a product's apparent or anticipated usefulness, such as that perceived via advertisements, or perhaps through seeing a neighbour or a member of the family using a service - this facet of usefulness relates to a consumer's initial impetus to purchase and appropriate. A second facet of usefulness is the embedding of the system into the individual lifestyle and everyday activities of household members - this facet relates to the idea of i-Tv's 'domestication' and the notion of *sustained usefulness*. Usefulness is also something which may become tacit – i.e. it is only when the technology or service breaks down that the value of its use is fully realised.[74]

Chapter discussion

In this chapter, following Woolgar (1991, 1996), Mackay (1995) and Mackay and Gillespie (1992), I have discussed a hermeneutic view of technologies where their characteristics, features, attributes and functions treated as 'texts'. They argue that the phenomena of investigation are the discursive and interpretive practices through which such artefacts as machines and tools are constructed. To suggest that machines are texts is therefore to deconstruct definitive versions of what machines can do. This

[74] ***Breakdown*** relates strongly to the notion of readiness-at-hand. By breaking down we become aware of the hammer, the television set, or other technology; "[the hammer's] 'hammerness' emerges if it breaks or slips from grasp or mars the wood, or if there is a nail to driven and the hammer cannot be found." (Winograd and Flores, 1987: p.36)

sets the frame for an examination of the process of construction (writing) and use (reading) of the machine. The relationship between readers and writers is understood as mediated by the machine, and by interpretations of what the machine is, what it is for, and what it can do.

Betti (1980) suggests that misunderstanding occurs with increases in space and time between 'authors' (which is suggested as analogous to designers and producers) and 'reader' (analogous to consumers and users). Following Tatsuno (1993) if the real object of user or consumer research is for firms to get 'closer' to their customers, then this requires firms to attain an understanding of how their products, in both physical and symbolic aspects, situates in the user's experience.

Put in hermeneutic terms this means *fusing the horizons* between product and user, between producer and consumer. Gadamer (1979) employed the notion of horizon in both a literal and figurative sense to suggest everything that is visible from a particular vantagepoint. It is in the fusion of horizons that the subject-object dichotomy is transcended. In the instance of technologies and people I suggest that this occurs in the instances and the practice of *use*. It is here that 'cultures of production' and 'cultures of use' interact, it is the point of most information.

The horizon of the user is their [pre-]understanding. The horizon of the technology is its sense discerned through semiotic-structural analysis and progressive iterations of the hermeneutical circle (Arnold and Fischer, 1994). The user's horizon is finite, but neither limiting nor closed. When the user moves or changes position through developing understanding or expertise, his or her horizon also moves. Horizons once fused never 'unfuse', as when one disposes of a product. The expertise and experience acquired from using or living with the product lays the foundation (the 'departure point') for the relation of new functional or feature requirements from new products.

Returning to the theme of 'culture of production' it would remain that path-dependencies, such as more general industrial trends and developments, form a considerable aspect of the [pre-] understanding of the horizons of designer and

producers, lending influence on design decisions. Meanwhile, apprehension of general trends and fashions in the market place will form some aspect of the [pre-] understanding of consumer-users, lending influence upon purchase and acquisition decisions. New components, new technical standards and new software techniques combine with desires to incorporate new fashions and trends in the look and feel of functions, casings and interfaces. These combinations find their way to the consumer marketplace where they undergo a further calculus of value and meaning made this time by user-consumers. Path dependency in use arises through the culmination in expectations and anticipations gained through the use and consumption of previous products.

But like written or spoken texts there is not an infinite range of interpretation that can be put to technology, and its functions. Grint & Woolgar (1997) are critical of a perspective in which there is the implication that there; "remains, at the centre of the technological system, a residual, non-social or neutral machine which is malleable according to its social location/context, etc." (p. 14) Indeed, even 'social shapers' concede that "technologies can be designed . . . to open certain options and close others." (MacKenzie and Wajcman, 1985: p.7). As MacKenzie (1995) offers using the terminology of media and audience research (i.e. Morley, 1992), technologies are 'polysemic'. This suggests there is always a 'preferred reading' which denotes that a toaster is used – or indeed is most useful - for making toast, or that a refrigerator is most useful for keeping things cool and a tin opener is best used for opening tins and so forth. This notion of 'best used for' - i.e. the purpose of something - may be linked very strongly to the notion of good usability. A tin opener may have good usability for opening tins but poor usability for opening wine bottles.

Together with the more immediate and idiosyncratic design challenges occurring in the project at hand, more macro-level trends contribute towards, as well as guide and shape final products (which is largely the position of sociotechnical constituencies). But throughout such processes what becomes immediately obvious to producers and designers as mistakes may not explicate the full gamut of mistakes or limitations that

will be experienced by consumer-users. Consumer-users come not only with fresh eyes to the product, but their interest in the product is derived from a unique gestalt of influences, motivations, expectations and requirements, which often deny the simplistic models that were used to represent their behaviours and psychology throughout the design process.

Kantor (1999) has drawn attention to this when she suggests: "Producers worry about visible mistakes. Customers are lost because of invisible mistakes." (p.9) Indeed what is considered a failing or 'success' within the context of design, may not map in any real sense to success or failing at the stages of consumption and use. This is evidenced in the multitude of unusable, or unused, features and functions incorporated into many new consumer electronics and software applications, or the unprecedented success of something which was considered merely a novelty.

'Obvious' defects, deficiencies and shortcomings are realised quickly in products which are established and well-known. Any global weakness, flaw or incapacity will be usually noticed early on in their development. The use and functions of such products are well defined, possessing a common-sense style of logic to their purpose, a logic usually closely shared by designers and users. Indeed, such products evoke with ease particular expectations and anticipations – from the designer's perspective concerning the product's actual and prospective users- and from the consumer-user's perspective concerning the product's performance and utility. The experiential familiarity of such products suggests, clear objectives (what I have termed as 'departure points') for improvement to designers and innovators. For instance, in the case outlined later, the problem of font size for reading text on a television screen opposed to a computer screen, was realised early on in the development of the Cambridge system. Comprising the first group of trialists were the interface and system designers. It was only through operating the system from their home that they came to realise a serious flaw. Using a desktop computer to design the interfaces, they had underestimated the necessary font size that would allow screen-based text to

be read from a distance (i.e. viewing text on one's television whilst sitting on the living room settee).

Familiarity not only provides a sound foundation for comparison, serving to indicate and benchmark improvement and differentiation, but also where one should focus attention in processes of fault-finding and fixing. It suggests the heuristics one may go through in using the product and in fault finding.

New, radical or discontinuous innovations, by their very nature, often deny any common sense or shared purpose and function, so here there is a greater dependence upon the creative resources of producers and designers. They must use their powers to project and anticipate value and usage. Litva (1997) sees that when this management-endorsed information is deemed inadequate, designers supplement it by creating and sharing their own customer-related information. The onus is upon them to introduce to the wider public domain something useful and desirable. Such projects are inevitably risky. Where there is no near product analogue, value (or usefulness) is something which relies inherently upon imagination, anticipation and rhetoric which has to be built (through marketing, and word of mouth etc.) around the product.

In these cases there is a greater propensity for products at the design stage to manifest non-obvious defects. These can include functional problems, redundant features, or even questions of taste or fashion. Each has the potency to make or break a new product's success, or to create a window whereupon a competitor can rectify and move in on one's first mover advantage in the marketplace.

The issue here is that path-dependencies exist both in design and in use. They may guarantee some level of continuity, and suggest forecasts, but they do not guarantee customer delight, which often springs from novelty, delight or surprise. These can only be found in the process of consumer-users developing new kinds of useful and valuable relations with a new technology and its function.

Conclusion

In the area of technology development Rycroft and Kash (1999: p.8) define 'complex technologies' as those processes or products which:

> " . . . cannot be understood in full detail by an individual expert sufficiently to communicate all the details of the process or product across time and distance to other experts. A simple process or product is one that can be understood and communicated by one individual."

This is an era of complex reasons and complex outcomes. Complexity in technology, society and the economy lead Rycroft and Kash to make the claim that corporate CEOs and managers; "don't understand why they are successful." (op. cit.: p.3) They suggest that success in our complex world is clearly dependent on ever-changing relationships among the organisations that participate in continuously adapting organisational networks In many cases, there is no point in explaining the technical specifications to a person who is simply seeking entertainment. However a technically informed enthusiast may only be impressed by a list of specifications above and beyond actual performance. However, in the longer term end experiential aspects will become dominant. Nevertheless, 'visions' [as 'departure points'] vividly illustrate ways in which the function and potentials of a technology may are linked to the possibilities of use. They show how social explanations of use can be used at once to leverage rationales for innovation, and subsequent acceptance by consumer-users.

Words and actions are the means by which people relate their experience of the world to others. Words and actions constrain, shape and give shape to things. Some views and some behaviours remain tacit to the individual consciousness. I suggest CU as a frame through which to study the person's whole experience of a product. While not tied to interpretivist study, and a hermeneutical perspective of 'technologies considered as texts', it certainly draws attention from this approach in discerning the privileged role that rhetoric plays in the consumption and experience of [particularly media-] technologies and products. As Gadamer (1976) has it:

> "Thus the movement of understanding is constantly from the whole to the part and back to the whole. Our task is to extend in concentric circles the unity of the understood meaning. The harmony of all the details with the whole is the criterion of correct understanding. The failure to achieve this harmony means that understanding has failed." (Gadamer, 1976: p.117)

It most importantly stresses the individual influences that from perceptions and anticipations of products, 'read' through encountering characteristics, attributes, feature and functions, in the physical product or via some form of representation. Hannah Arendt speaks on the foundation of commonality between people:

> "Human plurality, the basic condition of both action and speech, has the twofold character of equality and distinction. If men were not equal, they could neither understand each other and those who came before them could not plan for the future and foresee the needs of those who will come after them. If men were not distinct, each human being distinguished from any other who is, was, or ever will be, they would need neither speech nor action to make themselves understood. Signs and sounds to communicate immediately, identical needs and wants would be enough." (Arendt, 1958, and quoted in Jones, 1991: p.v)

The main theme of chapter has proposed two things. It follows the suggestion that it is useful to consider 'technology' as text. But it would rather decompose 'technology' into further 'sub-texts' one of which is usability. Usability understood as a text, is then *contextualised* within a variety of other texts that contribute to the apprehension of whole product, service, and technology. Each 'text' has both tangible and symbolic qualities. While usability may be elucidated by neo-empiricist study, a text/context view of usability points towards consideration of the *whole* experience which constitutes the product, and it can only be 'read' or comprehended as a gestalt of meanings and values.

Chapter 4 – On Method

" . . . the Greek civilisation . . . favoured intuition, insight and the intellectual processes, but not the extraction of secrets from nature by mechanical contrivance and experimental technique. This was not to come until almost 2,000 years later." (Boring, 1950: p.98)

"If every product is really a service, then every contact or communication with customers is also the product . . . Customer-focussed slogans and posters, even interfunctional problem-solving teams, are not good enough if departments do not share the same priorities or rewards." (Kantor, 1992: p.10)

Introduction

As mentioned in the previous chapter, beyond imagination, or purely speculative views of needs and requirements, lie perceptions of use, consumption and the user tempered and informed through various types of research practice. Some of these I have already touched upon, and in this chapter I shall discuss them more explicitly. Method as it is expressed in this chapter exists in three non-mutually exclusive dimensions– a discussion of the methods and procedures of the study, a discussion of the methods used to research the participants on the trial, and the methodological implication of contextual usability.

There is also the implementation of the research itself, and in the case examined here, issues arise regarding how a researcher responds to the difficulties of conducting research in firms under conditions of high dynamism and commercial sensitivity.[75]

Each of these challenged, influenced and shaped the empirical research of the present study as well as its outcomes and theorising. They also guided the choice of literature that was reviewed. Indeed, the theoretical concerns, and the methodological developments that culminated in the development of contextual usability, were a product of continual iterations in both theory and methodology, again both shaped by the exigencies of the trial as it unfolded.

To collapse 'push' with 'pull'

The move towards user-centred design and customer-focussed marketing and organisational philosophy would have customers involved right from the period of ideation, through the entire development cycle of product and [re-] organisation, even

[75] The environmental conditions of high dynamism and commercial sensitivity exaggerates Agar's (1980) notion of the "professional stranger." - the impossibility of the researcher being ever truly 'natural' in the process of conducting research in the field. Presence is accented in the case of commercial sensitivity. This is a massive problem for academics conducting research in the firm. I found it severely neglected in the literature. It is perhaps conveniently left aside in accounts of how

building plant and machinery, and specialist warehousing. It should stretch across value and distribution chains, and now in the networked society – right into people's homes where technologies can now report faults independent of user knowledge. Going well beyond Drucker's shifting of emphasis from profit to relevance, here we have a much more radical proposition.

Many of the problems that arise with the introduction of innovations can be attributed to separation of and conflict between users and developers (Papanek, 1973; Staudenmaier, 1985; Suchman, 1988). As previously explained, this level of 're-engineering' and 're-conceptualising' business spreads across enterprise boundaries, entire value and distribution chains, from idea to living room, mind, pocket and activity. For some time now it has been advocated that entire firms [their partners and distributors] should now "think like the customer." (Kanter, 1992) But is such a goal attainable, practical, and if so how is it to be obtained, implemented?

If such a goal can be attained it will only be so by *interacting* with customers and users. As Poole and McPhee (1985) have it; "what we can know is determined by the available methods for knowing." I have already mentioned frameworks used in industrial design such as quality function deployment speak of parsing the 'voice of the customer' with the 'ear' of the engineer (Hauser, 1988; Hauser, 1993; Hauser and Griffin, 1993). But much of the literature on QFD pays scant attention to how engineers, or indeed engineering firms, hope to capture the customer's voice. Much of the methods illustrated is basic textbook marketing or consumer research-based. The majority of the framework is focussed is taken up with engineering decision-making (i.e. Nicoll, 1999b).[76] Consumer data features only at the beginning of what is essentially a 'waterfall' model of development, linear in nature, and lacking any iterative involvement of consumer-users over the development process.[77]

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things really are in pressurised commercial settings, leaving sanitised, 'tidy' accounts? This is rather like in neo-positivist studies where 'null' results are rarely included for publication.

[76] QFD featured in the case outlined in the thesis. It was one of the techniques the firm explored in relation incorporate into their development processes.

[77] Kantor (1992) suggests the quality movement of the 1980s and early 1990s has also been criticised for being too 'producer-orientated' merely focussing on reducing the costs of visible markets. MacKay (1992) also criticises social constructivist approaches for being too narrowly focussed upon

I have already gone some way to highlighting that collapsing notions of 'push' with 'pull' with respect to new product development has already arisen in the succession of new fads, fashions and philosophies in management (see for instance, Abrahamson, 1996). For instance *Total Quality Management TQM* (i.e. Bounds *et al.*, 1994) is one such philosophy aimed at orientating the *entire* business towards raising quality. It comprises various tools and methods set to achieve this.

Anticipating use

But can the outcomes of technologies be properly anticipated, even with the most rigorous and reliable methods of research? While we may be able to gauge how things *can be* used, or suppose how *they were* used (the field of Archaeology largely depends on this ability). How they *will they be* used I have already suggested as representing a more difficult prospect to forecast. I have shown how it is often confounded by user innovations, or simply by unforeseen implications of use (such as in the Pruitt-Igoe Housing project example cited earlier). Fleck's (1993b) theory of *innofusion* also outlined earlier suggests that particular technologies are best innovated through deployment and implementation, in the sites and situations of use and operation.

His model is a kind of *soft determinism* (such as suggested by Pool, 1983; and Grint and Woolgar, 1997) where a generic technology (Fleck's example is industrial robots) acquires attributes and characteristics through addressing a range of exigencies encountered through deployment. These include existing ways of doing things, knowledge and expertise of the firm and so forth. The *configurational* nature of technology - its ability to mutate and customise features and functions - crystallises relative to potentials to address the exigencies of implementation (Fleck, 1993a).

Exploring and understanding the exigencies of use is what John Seely Brown cites as constituting some of the most important research at the Xerox Corporation (Brown,

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construction of technology.

1991). An anthropologist, Lucy Suchman began her work at Xerox by studying the practices of accounting clerks in 1979. She found significant discrepancy between what the clerks *said* they did, and what they *actually* did. Their verbal descriptions of what they did correspond more or less to the *formalised* procedures of the job (as written down and prescribed), whereas the *actual* job they did relied on a rich variety of informal practices that were crucial to the getting the work done. Indeed, the clerks were found to be constantly improvising and inventing new methods to deal with unexpected problems.

The basic reason for intermediaries to act and evaluate within the space between designers and users is to attain some sense of objectivity. Donald Norman, outlining what I have already explored in some depth in the previous chapter sees that when we design: "we tend to project our own rationalisation and beliefs onto the actions and beliefs of others." (1988: p.155) Designers and producers have an obvious and distinctive vested interest in the product they develop, and this can act towards creating a biased (and often overly optimistic) view regarding its potentials. Their enthusiasm for the product, or simply their intimacy with its operational premises can blunt proper critical appraisal. Designers themselves recognise that they can; "often know the product too well to envision how people will use it." (Dan Rosenberg, product designer quoted in Norman, 1988: p.158) Any representation of users is based on the designer's personal experiences and assumptions "more often than we might think." (Walsh, 1996: p.514) Indeed, in the case of the design of a food processor Chabaud-Rychter (1994) showed the way in which male design engineers used (weak) models of women users based upon their mothers, wives girlfriends etc. and how they *perceived* them using such appliances.

This is a clear case of how socially conveyed knowledge blends with the experience of reality of the individual.

> "Structures of formal knowledge tend to be abstract and general. They must often neglect some details, complexity or deviations from the rule for the sake of simplicity or conceptual clarity, but actual performance in any field requires knowledge of how these things work together and how they affect the principles and relationships developed in the formal system. In the area of

> technology this is particularly true because technology is always orientated towards function, not just formal understanding. A technology must work, it cannot simply be a good idea; it is ultimately concerned with practice, not just theory. Any knowledge of practice (engineering, nursing etc.) always involves a large amount of contextual knowledge, or accumulation in the person of many specific experiences, related by common sense to form a holistic attitude, one that is not fully analyzed and formalised." (Brach, 1991: p.16)

Formal knowledge is knowledge that can be written down and is more easily transferred; tacit knowledge is usually only learnable by doing and is therefore harder to transfer. Knowledge of products may be generated in three fundamental ways. It may be developed through appropriating data drawn from observations of the sites and situations of design, production, distribution, consumption or use. It may also be drawn from the perceptions of those that have designed, produced, distributed, consumed or used the product. It may also arise from social events such as regulatory and standard committees, or even from legal cases.

Suchman (as in Suchman, 1988, 1995) went on to have a very distinctive influence upon the thinking in computing and artificial intelligence by edifying use contexts in the realms of situated and distributed cognition, (others making contributions in this area include Zuboff, 1984; Norman, 1991; Carroll and Rosson, 1992)

Ethnographic turn

Carroll (1997) argues that work such as Suchman's should be viewed as occurring within a much larger paradigmatic restructuring occurring within social and behavioural sciences at this time – what has been referred to as the 'ethnographic turn' (Moores, 1993; and also Knorr-Cetina, 1981 with relation to social studies of science).[78] It was turning entrenched views that aimed at studying individuals independent from the contexts and conditions in which they operated, worked, experienced and lived. What Guba (1990) calls the 'paradigm dialog', was challenging scientific positivism and reductionism as the dominant method for

[78]Interpretism originated from literary theory and hermeneutics. What is interesting to note is that pundits of literary theory who have had their "linguistic" and their "interpretive" turns now appear to turn their sights upon a "historical" one (McDonald, 1996).

consulting studies where people were involved. Instead interpretative, ethnographic studies conducted in the 'field' - office, factory floor, people's homes - were replacing lab-based methods of discerning the qualities and attributes of products. As in the work of Suchman (1983) they were drawing attention to tacit, implicit influences in what people did with technologies, media, products, designs and other people in their everyday working and domestic lives. Such approaches sought to explore and conduct inquiry in as *naturalistic* setting as possible (Erlandson *et al.*, 1993).

'Getting closer' to customers is not exclusive to emerging high-tech markets. It also features in relatively mature markets. Pragmatic approaches arise in new types of experiential marketing techniques for more mature products. For instance, Lauglaug (1993) outlines *Technical Market Research*, which uses 'antennae shops,' which set up in shopping malls where firms can interact directly with, and get feedback from, consumers (his example was a tire manufacturer).

McKenna (1995) refers to a similar process in the case of Philips NV sending multidisciplinary teams of designers and social scientists by mobile vans into communities across Europe. The aim was to enter into a dialogue with consumers regarding new designs, where specialists and customers "interactively imagined new possibilities." (p.88) McKenna sees that through these techniques; "companies can foster interest in the [new] product before it reaches the market. Customer acceptance of a new product is part of the process of developing it." (p.92) Closing the space between designers and users is now a preoccupation of business and industry, and since the early 90s there has been a trend towards an increased use of social scientists in the innovation process (Cove and Svanfeldt, 1992).

Methods of getting 'closer' to consumer-users are now widespread and practised, all be it in different ways, in different organisations. For instance the Intel Corporation have an anthropological laboratory which is sited in their main production facility, the object being that they can study the everyday use of things and work out directions to move in the future. John Thackara (1998) also points to Sony's

enrolment of cultural anthropologists to brief software engineers, and Sharp employing sociologists to study the everyday routines of people. The object is to discover and fill any 'gaps' they discover. While 'gaps' may be limited in the case of discrete, simple and mature technologies, they become more obvious with the advent of 'smart' or 'intelligent' networked products. The significant plasticity in their functions and configurations, and with their distinctive reliance upon a wider spectrum of human factors and temporal relevances, bring a new dependency upon frameworks that generate valuable design knowledge.

Interpretative Paradigm

Most methods of 'getting closer' to customers have their origins in "interpretative social science", which over the last half century, has emerged as a new research paradigm that aims to break out of the constraints imposed by positivism in understanding the social world. Since the 1970's, a shift has occurred in open system's research from individualist, formal cognitive models to models situated in and grappling with, complex real world dynamics (Hutchins, 1995). The term "interpretative social science", which includes many of the qualitative research theories and methods, represents a very large spectrum of philosophical, empirical and methodological orientations.[79] With its emphasis on the relationship between socially-engendered concept formation and language, it can be referred to as the 'interpretative paradigm'. Containing such qualitative methodological approaches as phenomenology, ethnography, and hermeneutics, it is characterised by a belief in a socially constructed, subjectively-based reality one that is influenced by culture and history: "language is the universal medium in which understanding occurs." (Gadamer, 1979: p.389)

[79] It is a generic term covering many different approaches to inquiry: The *verstehen* tradition of Dilthey, Richert and Weber; the phenomenological psychology of Brentano, Stumph, Külpe, Husserl, Heidegger, and Shutz transformed into the ethnomethodology by Garfinkel, Sacks and Schegloff; the symbolic interactionisim of Mead, Cooley, Blumer and Goffman among others; the followers of Ryle and the later Wittgenstein who emphasised ordinary language analysis, speech acts, accounts and justifications; the ethogenics of Rom Harré; the dramatism of Kenneth Burke; the ethnographies of Clifford Geertz, constructivist and naturalistic inquiry of Lincoln and Guba, and so on.

Geertz, (1973: p.5) construes interpretative anthropology; "not as an experimental science in search of law but an interpretative one in search of meaning," and Taylor (1977) stipulated that interpretative sciences must deal "with one or another of the confusingly interrelated forms of meaning." (p.101) Through language, experience is filtered, encoded, and communicated in dialogue. It bridges past and present, interpreter and text: it conveys and propels tradition." (Arnold and Fischer, 1994: p.58) Many fields such as empirical studies of usability, audience research and studies of consumption have embraced the views and practices of the interpretative forms of research. This is because of its distinction pragmatically from neopositivist approaches, as well as its epistemology. Concentration is placed upon a research subject's perceptions of the qualities of a phenomenon, rather than that of the researcher. Qualities in this case are closely associated with the elicitation of 'meanings' - the sense that particular phenomenon have for individuals, and their ability to convey and communicate that sense:

> "There is a move away from obtaining knowledge primarily through external observation and experimental manipulation of human subjects, towards an understanding by means of conversations with the human beings to be understood. The subjects not only answer questions prepared by an expert, but themselves formulate in a dialogue their own conceptions of their lived world." (Kvale, 1996: p11)

There is considerable disagreement among advocates of interpretation about whether inquiry should focus on actors' accounts of their own meanings, theorists' readings of actors' meanings, theorist's interpretations of actors' accounts of their meanings and so on. Menzal (1978: p.165) criticises glossing over of difficulties by researcher's searching for meanings. As he sees it the procedures for understanding subject's meanings "require great efforts and long periods of time."

Human ideas, experiences and intentions are not objective things like molecules and atoms. Nevertheless, just like some of their colleagues in the Natural Sciences, many social scientists attempt to use "objective" methods that allow for the control, predictability and "generalisability" needed to uncover the "laws" or "patterns" that guide human behaviour and the systems in which that behaviour occurs. The scientific method constructed to do this has long been claimed to be a value free tool

of inquiry, allowing many social scientists to create a separation between themselves, their methods and their research. This separation is a very dangerous one, for it gives scientists a false authority of truth that stems from the claims that there is an objective way to study an "objectifiable" world and that the only way to study this world is through rigorous application of the scientific method.

Ethnography

The approach which aimed to research the trialists in this study was developed largely in response to a further piece of ethnographic work - Silverstone, Hirsch and Morley's (1991) pioneering ethnography of the use of media technologies in London households. They drew attention to the complex of social and psychological contexts that dictate domestic ICT use, and the methodological complexities arising from the study of domestic spaces.

Ethno - *folk* and graphy - *description* originally implied the means by which an anthropologist documented some distant and alien culture's customs and beliefs (i.e. Malinowski, 1922/1978). They would go 'into the fields' observe, draw inferences, and write for an interested audience. It has recently been employed in more proximate settings such as the micro-social environments of nursing (Morse, 1994), television audiences (e.g. Lull, 1988; Morley, 1989; Moores, 1993) and children's computing (Turkle, 1984). The objective of ethnography keeps with the general principles of interpretist social science in that it seeks to apprehend the social environment from the subjects' point of view. But can also include data gathered through other methods (Pelto and Pelto, 1978). Silverman (1985) also notes that ethnographers can also use census and statistical procedures to analyse patterns or to determine who or what to sample.

Ethnography as originally practised, had the researcher spending protracted periods of time in the field. This would clearly be impractical for projects that involve the development and testing of new products, such as the deployment of interactive television. Indeed, one could request, and even be granted access, to live in a family

home and to follow their everyday domestic routines for six months, including how they incorporated i-Tv into daily life. But such a prospect is clearly untenable for a number of reasons. With respect to the present study some of the sampled households did not 'switch on' the i-Tv system on for many weeks at a time. While providing insights perhaps on a particular family's existence, such a study would not have much to say on i-Tv. No method is perfect as all are to one degree or another invasive acts within the normal day to day flow and nature of activities. Naturalistic behaviours, expression of views etc will most certainly be impacted upon by the continuing presence of a researcher whose very presence will change that under investigation. Such practice is also, to varying degrees, an interpretative procedure, which come under the discretion of the researcher's bias, ideological influences and worldview.

Similarly, it is not often possible, nor desirable, to spend protracted periods of time in a firm. Unless one secures good trust, observing those working can again stilt natural behaviour. Also one's eyes cannot be everywhere at once, and so one can only truly derive a fragmented view of 'what is going on'.

These problems have brought about a different kind of ethnographic research than that which suggests protracted periods of time spent in the field. Examples here are the *ethnographic interview* (Spradley, 1979), or the *long interview* (McCraken, 1988), or the *long conversation* (Silverstone, *et al.*, 1991). Some commentators on 'real world' research go so far as see little difference between ethnography and other intepretive styles of research such as naturalistic inquiry and case study interviews (Robson, 1993).

Yin (1989) notes that a *case study* investigates a contemporary phenomenon in its real-life context. This is where the boundaries between phenomenon and context are not clearly evident, and in which multiple sources of evidence are used. Perhaps most relevant to the present study Yin goes on to suggest that case studies are the preferred strategy when 'how' and 'why' questions are being posed, and when the investigator has little control over events. Yin (1989: pp. 10-11) describes, "Ethnographies

usually require long periods of time in the 'field' and emphasize detailed, observational evidence . . . In contrast, case studies are a form of enquiry that does *not* depend solely on ethnographic or participant-observer data." These approaches may sometimes represent something more of a 'snatch and grab' or 'guerrilla' style of research activity. But in the dynamic environment of high-technology this is often the best one can do.

It is simply not possible in many cases to go as 'deep' as one may wish. And as was the case in the present study one must use a 'bricolage' (i.e. Levi-Strauss, 1968) of information, interviews, e-mails, informal chats, new reports, company literature and other sources to build a picture of what is going on.[80] The object of ethnography is similar to many other interpretist approaches, such as hermeneutics, phenomenology, and so on. One looks for recurring 'themes' which appear to be shared between members of the classification: "every particular is also a sample of a larger class. In this sense, what has been learned about a particular can have relevance for the class to which it belongs. The theme embedded in the particular situation, extends beyond the situation itself." (Eisner, 1991: p.103) Through highlighting these themes one can sample something of the view of the 'interpretative community' regarding some particular phenomena.

Such studies can differ immensely in approach and intensity but they do represent a commentary upon method. Positivist and reductionist studies can deconstruct already reasonably understood and controllable phenomena, where design and hypothesis predicts outcome and relations, but where things are 'messy', difficult, and little understood or controllable one must adopt a more open, adaptable and receptive approach.

> "These [ethnographic] approaches are holistic in emphasis and are fundamentally concerned with the context of actions: thus, the argument runs,

[80] This keeps with much of the thinking arising from the social constructivist studies of technology, a good example being Latour's *Aramis -the Love of Technology* (1996). Its contents were derived from extensive interviews with the key people in government and industry that were involved in this research and development effort. A great many documents were also reviewed and assessed. This showed that what the technology 'was' varied according to the perceptions of the various interest groups.

> an action such as the viewing of television needs to be understood within the structure and dynamics of the domestic process of consumption of which it is a part...television watching is, in fact, a very complex activity, which is inevitably enmeshed with a range of other domestic practices and can only be understood in this context." (Morley, 1992: p.173)

Clifford Geertz (e.g. 1973) regarded as a modern authority on ethnography, introduced the term 'thickness' of description as a key concept in ethnography. Derived from Gilbert Ryle (1949) this suggests that the more detail that is outlined into an ethnographic text, the more potential there is for a fuller, multidimensional 'reading' by the reader. In *Works and lives: The Anthropologist as Author* Geertz (1988) acknowledges the role of rhetoric: " . . . their capacity to convince us that what they say is a result of their having . . . truly "been there." (pp.4-5) But access, and 'reason for being there' is a definite problem.

> 'The way in which the participant-observer gains access to the field setting, the problems and refusals encountered there, the shifts in their interpretations as time goes by and they become more "experienced", are all important to understanding the researchers account. They specify the relationships that underlie and "contextualise" the researchers findings' (Poole and McPhee, 1985: p.128)

It is commonplace in the literature of ethnographies, case studies, ethnomethodology action research and participant observation that 'observers' can take on a number of different roles, each differing in terms of "distance" from the subject of study. Gold (1958) distinguishes four of these roles: The *complete observer*, the *observer-as-participant*, the *participant-as-observer* and, and the *complete participant*. This range of roles has an implicit, but often neglected feature - they all assume that the researcher has a definite theoretical model that guides the selection of the role and how the role is put into action in the research situation.

The 'complete observer', while perhaps epitomising the open approach to research, is often not practical or even desirable in the area of media ethnography, or organisational studies. Most researchers conducting ethnographic research have a theory of what is important to look for in the research situation. This limits the types and forms of explanatory concepts or mechanisms that are drawn out 'inductively' or

'retroductively' or by means of 'situationally guided hypotheses'. Put simply the focus of the research, although making coherent the 'chaos' of the real world, limits perspective on what may be an important agent or factor in the creation of a phenomena or in a particular thought or act.

Agar (1980) notes that ethnography is both a process and a product and goes on to state emphatically: "Without science, we lose our credibility. Without humanity, we lose our ability to understand others (p.13)." Again it is the researcher who becomes a catalyst for the research, as opposed to removing themselves from the research process as in neo-postivist studies. As in phenomenology, ethnography has an intrinsic reflexive character, which implies that the researcher is part of the world she or he studies and is affected by it (as well as effecting various contingencies of that world). As Atkinson (1983: p.14) has it, both extreme positivism and naturalism;

> " . . . assume that it is possible, in principle at least, to isolate a body of data uncontaminated by the researcher, either by turning him or her into an automaton or by making him or her a neutral vessel of cultural experience."

Charmaz (1995) notes that the field of sociology carried a strong tradition of ethnographic research from its roots until the 1960s, when it lost favour to the rise of sophisticated quantitative methods and the adoption of the logico-deductive model of research. She sees this period as one which lacked new theory construction, as under the logico-deductive approach studies were informed by some pre-existent theory, and the subsequent establishment and proving of hypothesis based upon this.

Glaser and Strauss (1967) were among the first to challenge this, through their *grounded theory approach.* This aimed to generate new theory by bridging interpretative analysis with positivist assumptions. Grounded theory was largely influenced by the pragmatic philosophical tradition with its emphasis on studying process, action, and meaning, and particularly the symbolic interactionism of Mead (1932, 1934, 1936, 1938) and Blumer (1969) and others coming from the Chicago legacy of ethnographic research.

Glaser and Strauss (1967) argued that grounded theory methods cut across disciplines, and it significantly contributes to the foundations of the 'ethnographic turn' (Moores, 1993) or the 'interpretative turn' (Geertz, 1973). This was the paradigm shift that they view has emerged in social science research since the 1970s. While he refers specifically to audience and media research, scholars coming from a wide range of disciplines have also registered this move to ethnography and ethnographic-style of research – for instance Maurice Holbrook in his discussion of evolving perspectives in the area of consumer research (Holbrook,1995). The shift from neopositivistic and hypothetico-deductive methodologies, and "managerially relevant studies," was based on realisation that Holbrook and others "had turned to an emphasis on the emotional aspects of consumption experiences, our style of doing consumer research had moved fairly far away from the traditional preoccupation with making discoveries for marketing managers." (p.14)

Ethnography in HCI research

In the field of HCI research there was a lag of some ten years before researchers began to adopt a gradual focus on the contextual and cognitive determinants of use (Carroll, 1989; Good, 1989; Maskery & Meads, 1992). The origins of this may be traced to writers in the 1970s, such as Hubert Dreyfus (1979) and Joseph Weizenbaum (1976). They assembled philosophical arguments about whether human beings could ever be replicated by machines. They claimed a unique cluster of human attributes focused on the drive from artificial intelligence to replicate and model human intelligence. This raised the question: what is human about human beings? Close examinations of machine functioning in real world settings saw computers as rigid, often agents of power and bureaucracy but not sentient in their own right.

Such questions developed in the fields of artificial intelligence (AI) and also, but also with respect to the operational relations between humans and computers. A number of investigators began to argue that interactions between people and computers is too complex for overarching theories (for instance, Landauer, 1991), and others began to argue that positivism, and the experimental basis of much HCI research, was largely

irrelevant to progress in design (Carroll *et al.*, 1991; Pylyshyn, 1991). Computer scientists began to show interest in ethnographic studies of practice of computer use. Such studies continually focused on human creativity and the local nature of contingency in workplaces, making universal, formal, rational systems a seemingly impossible goal (Star, 1989). Included here should also be Turkle's (1984) pioneering ethnographic study of children's interpretation of computers; Suchman's (1988) studies of situated plans and actions; and Winograd and Flores (1989) exploration of the nature of computers and design. Also Forsythe's (1992) ethnographic work on artificial intelligence research and Gasser's (1986) study of people struggling with standardized systems at work, emphasised how people always "work around" the rigidities or remoteness of computing from human experience. Each of these studies conveyed a sense of the limits of computers, of formal modeling, and of rationalisation.

Carroll (1997) notes that by 1990 there was a clear consensus that the cognitive modelling approach had failed to provide a comprehensive view of human-machine interaction, and a "more socially or organizationally oriented approach was required to supplement or replace the cognitive paradigm." (p.510) 'Ethnographically informed design' (Bently *et al.*, 1992) rose to prominence in this climate. The late 1980s and early 1990s saw the gradual diffusion of more interpretative, ethnographic-style positions in HCI research (most notably, Nardi, 1992; Holtzblatt and Jones, 1992; Whiteside and Wixon (1987b); Whiteside *et al.*, 1988). Each has significantly developed thinking and practice.

However, this subtle shift in perspective had been slow to take hold in development communities. Only recently has the contextual perspective and its implications begun to penetrate development citadels (Holtzblatt & Byer, 1995; Holtzblatt & Jones, 1992; Hughes & Randall, 1992; Simonsen & Kensing, 1994, 1997, 1998; Simonsen,1996). As the competition in today's computer industry grows fierce, software manufacturers have recognised the need to bring technology to users not only in terms and concepts that are easy to use but with a fundamental design derived

from an intrinsic awareness of the user's work practice and cognitive models (Grudin, 1993).

Most notably the development of *contextual inquiry* (Raven and Wixon, 1994) and *contextual design* (Wixon, Holztblatt, and Knox, 1990; Holtzblatt & Beyer, 1997). Contextual Inquiry (CI) is a process first pioneered by Karen Holtzblatt in the early 1980s. CI provides a way to collect data on users in their environment adapted from ethnographic research methods. Pragmatically orientated to industry, it is intended to fit the time and resource constraints of engineering environments (Holtzblatt & Beyer, 1997).

CI enables the researcher to gather data from real tasks in the workplace. The basic premise in the interview is to develop a detailed work model that is true to the user. This model is generated through a series of observations and questions directed on the immediate tasks. Contextual design was intended to addresses a number of the inadequacies in previous methods by emphasising: interview methods conducted in the context of the user's work, co-designing with the user, building an understanding of work in context, and summarising conclusions through out the research:

> "Context tells us to get as close as possible to the ideal situation of being physically present. Staying in context enables us to gather *ongoing experience* rather *summary experience*, and *concrete data* rather than *abstract data*."(Holtzbaltt and Beyer; 1990; p.47)[81]

The contextual method is a formal method of field research and data modelling that begins with the observation of users within the context of the workplace. Users are to be studied in their normal working context, as they execute ordinary work assignments. Experimenters following the Contextual Inquiry technique observe users working and record both how the users work and the experimenters' interaction with the users. The contextual method is rooted in ethnographic or naturalistic

[81] Holtzbaltt and Beyer define *summary experience* as the explanatory characteristic of summarising or shortening accounts of an experience. This contrasts with *ongoing experience* where being with the person as they operate or perform tasks shows the complexity of what one actually does in detail. Similarly *concrete data* differs from *abstract data* in the way it offers detailed accounts of behaviour as unique events rather than simplified routines.

research in which the researcher becomes part of the subject's environment in order to observe spontaneous, natural behaviours and interactions (Diesing, 1971; Jacobson, 1991; North, 1987).

Research within the Cambridge Trial

Both quantitative and qualitative approaches to studying the trialists featured in the case of the Cambridge Trial. The present study of the Cambridge Trial began in a quantitative style, and was intended to use usability tests and survey schedules. These would be subjected to quantitative analysis. However, under the conditions of rising complexity it gave way to a study that became entirely interpretative in nature, consisting largely of open-ended case study style interviews with company personnel and later trialists in their homes. (I explore this in more depth in Chapter 7.) Interviews with company personnel provided the material of chapters 5 and 6, while the interviews with the trialists are outlined in appendix 1 – The Cambridge Trialists. A number of reports also fed back into the study that was conducted ***within*** the Cambridge Trial (i.e. conducted by, and on behalf of, the working group on user research). This was the research of trialists, designated first by Om (working in collaboration with myself), and then subsequently under the jurisdiction of the working group responsible for user research. This working group consisted of representatives of the principal service providers (PSPs) and myself. They decided upon a multi-method approach including the use of surveys, online questionnaires and system-logging. As such it was a hybrid of quantitative, positivist and qualitative, interpretative approaches.

System-logging

There is a kind of bias in private sector social research towards quantitative approaches. One area where this has been particularly prominent has been audience research. By the 1950s with the advent of television, elements of media research spun-out from academia to become a highly profitable sector in its own right. The new private sector research organisations became powerful intermediaries acting

between television stations and advertisers. They promised to certify the power of certain channels and programmes in their ability to draw audience, and therefore to serve as potent platforms for advertisements. Such circumstances also came to prevent funding opportunities for academic research from either media institutions or government. The commercial organisations were wary of academic reformism in research practice which still remained strong (even under conditions of bad funding) and; "at least by implication critical of the [private sector's] media practices." (McLeod *et al.*, 1991: p.240) This predominance of quantitative methods of research activity, most commonly known as 'ratings' research, remains the major means by which programme schedulers decide which programmes remain and which are dropped, as well as negotiate revenues from advertising agencies.

A new vista in tracking both use and consumption has been opened by digital communications systems such as the Internet and i-Tv. Any change in the internal state of a digital system can be registered. Following similar lines as those found in behaviourism, and in particular participant observation, are digitally-enabled approaches aimed at mapping the frequency and duration of events of similar nature for the purposes of registration and calculation. Beyond registering and defining autonomous internal changes of the system are those initiated by the user via the interface. The interface allows passage of stimulus from extraneous sources (i.e. the environment via sensors, or the human world in terms of intentional button pressing) to enter the realm of the technical system where it changes its state. Registering these changes of state, can serve to monitor and provide a window on incidences of *use*. By adding other basic dimension defining digital systems – *the ability to store and process data* – individual acts of use (or changes in states of the system) can be linked, sequenced and correlated statistically leading to the development of inferences regarding patterns of use (usage).

Networked media technologies, whether a computer/modem or cable/satellite based interactive television system provide ways by which 'interested others' may 'people meter'. This is one of a range of user-consumer data that may be gathered via a digital

communications system. Other techniques include online questionnaires, the use of vignette- style quizzes, and direct communication one-to-one online. A domestic i-Tv system through logging on and accessing its server, can provide information regarding the length of use of the entire session and of its component parts - i.e. the proportion of session time spent on games opposed to news etc. It can provide data concerning the interaction style of particular user households (high interaction, low interaction styles), which may indicate which services are most frequented within the household and so on (see below).

Table 4.1 Sys-log and its data

Activity	Data Generated
Television on-off times	When? How Often?
Shows and advertisements watched	Which were viewed in part, which were watched in their entirety? Did viewers hit 'tell me more' for further information?
Electronic Programme Guide (EPG)	Which lists and which features were explored? How did this compare with what was subsequently watched?
Items purchased online	What? From who? From where (i.e. which ads) Completed purchases against attempted purchases.
Services used	Which, how often?
Forms and surveys	Viewers requests, quizzes, etc. Which incentives drives responses?
Games	Which games, format, genre etc?

When the above data is combined with the information which is provided on sign up (which may include income, profession, number of children, newspapers taken, other products owned, hobbies and pursuits and so on), 'interested others' have significant insight into household constitution with respect to tastes, preferences and consumption.

However, it was technically uncertain whether individual users would have to logon separately into the Cambridge system, or to different services. In the case that this is made possible (as indeed it is with personal digital assistants and mobile communicators) there may be some potential for asserting use and usage at the

individual level. Until then use will be at the household level of analysis (which will need augmenting with ethnographic style research to allow for reasonable assumptions to be drawn regarding service/content preference at the individual household member level). An example of the sys-log data as used in the Cambridge system is provided in appendix 3.

Tracking of system use has formed a major part in experimental style usability testing and HCI since the advent of dumb terminals connected to mainframe computers. Quantitative measuring of usability have set the definition of what is meant by "ease of learning" and "ease of use" (Dumas and Redish, 1994). Dumas and Redish recommend 'planning your observations' for the following major reasons:

> "... in a typical test, a great deal is happening very fast. If you don't think about what you want to focus on , if you just go into the test "to find out how the product is doing," you may miss critical information that you need to understand how to fix the problems that people are having."
>
> Also:
>
> "you need accurate counts of relevant measures to know how serious participants' problems with the product are. You need the numbers to convince managers and developers that the problems are real, serious, and need to be fixed." (p.184)

Lab-based usability testing usually involved the setting of particular tasks, whose completion was monitored by the tester in terms of 'performance measures'.[82] The recommendation is the use of quantitative 'performance' measures to:

> 1) Focus and plan observations to locate 'critical' information.
> 2) Develop relevant measures by which to evaluate the 'seriousness' of problems.
> 3) Provide 'convincing' evidence which will provide justification of your observations.

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[82] Dumas and Redish (1994) cite the following examples of performance measures in usability testing usually included the following:

- time to finish a task
- time spent navigating menus
- time spent in the on-line help
- number of wrong menu choices
- number of wrong icon choices

There were also entire ranges of performance measures based on a test participant's emotional state while experiencing problems and faultfinding (whether they experienced frustration, confusion or satisfaction). There would also be a range of measures with respect to manual help, or calls to a help-desk for aid. For the most part most of these are irrelevant, or a least much more difficult to isolate to any meaningful degree when tackling the informationally rich context of home-based entertainment orientated systems. Registering how much time people take say to, access a certain page, restart a video game, return to a 'home' page, navigate through various screens, how many times they 'zapp' or 'zip' through a video, how much time they spend deciding on purchasing goods or services, how many times they returned to a page illustrating a good or service before purchase and so on, allows a much wider spectrum of use data than was ever before possible via 'people meters' or traditional market research techniques or by usability testing. Implicit within the use of the system are behavioural data that are equally valid for researching on-line consumer research as they are for evaluating usability.

What sys-log files capture is very much akin to what was available to those usability researchers who went beyond simple observation into the tabulating of keystroke information gathered through use of a system. This information once gathered can be used to tabulate occurrences of button presses on the remote control and then analyse their sequences. With respect to the sys-log data derived from the Cambridge trial, there remains the problem of who in the household was using the system at any one particular time. Access codes were issued at the level of the household, and these were often shared between, for instance, family members. This meant that any usage data drawn from the system could only show the usage of that particular STB and *not the usage of the system by any one particular person.* The company discussed the matter of supervisor user access codes in the early stages of development. The main driver was to restrict access to adult material by children in the household. However, due to the situated use of the STB in shared areas of the house this was looked upon as non-feasible. The belief was that it was impractical to implement a system which

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- number of times online help was accessed

required a person wishing to log on to a particular service, would have to request that another would have to log off. This raises concern that people would find such a feature cumbersome, and would probably ignore its use anyway, preferring instead to log on once and let others use the system as it stood.

As will be illustrated in the later chapter outlining the experience and process of the research, the production of quantitative sys-log data seemed to be privileged over qualitative data. This may have been due to a number of reasons. It may also have been due to the institutional bias of the particular department at NOP Research, who had taken the chairmanship of the user research group, and whose main media research approach was large-scale survey work and aggregate statistics. A desire for the group to explore the parameters of what sys-log could do as an *innovation in itself.* There is a definite seduction in system logging as a means of automated marketing and consumer research. Turnstile counters at sports grounds, counters tracking traffic across a bridge, or counters detailing the production of widgets from a production line show the obvious benefits in the automated registration of quantities. A further reason already referred to earlier, is the way in which quantitative data and their subsequent communication by means of figures and graphs can often appear 'more scientific' and carry more persuasive power than the 'stories' and 'scenarios' of qualitative research (Holbrook, 1997).

Nevertheless knowledge derived from system-logging has led some commentators such as Regis McKenna (1995) to suggest that a new era of personalistion is to emerge which; "harkens back to the days when the butcher, baker, and candlestick maker knew their clientele personally . . . A cabinet maker designed and manufactured by interacting constantly with the customers. The customer got immediate responses and assurances." (p.90)

One of the problems with sys-log in various systems – credit cards, interactive television, supermarket transactions and reward cards, banks - is that it produces a massive amount of data, which leaves many organisations at a loss regarding how to

process this.[83] There is a lack of proper techniques to analyse, package and sell massive amounts of data (something in the region of 5 terabytes - 1,000 gigabytes, or one million million bytes - of anticipated data a year). A suite of techniques, collectively known as data mining, offers one possible solution. Data mining uses machine learning and data visualisation techniques to facilitate and automate pattern recognition in large data collections. However datamining is an immature, unstable market today, with the technology and its understanding needing perfected by business analysts.[84] 80% of a datamining process involves resource intensive data pre-processing such as the Gartner group's *five-stage model*.[85]

Consensual approaches to research

> "A computer system does not itself elucidate the motivations that initiated its design, the user requirements it was intend to address, the discussion, debates and negotiations that determined its organization, the reasons for its particular features, the reasons against features it does not have, the weighing of tradeoffs, and so forth. Such information can be critical to the variety of stakeholders in a design process: customers, services and marketers, as well as designers, who want to build upon the system and the idea it embodies. This information comprises the design rationale of the system." (Carroll, 1997: pp.509-510)

One final point relevant to methodology, which can be understood within the context of the discussions raised in chapter 2 regarding the complexities of social constructionism applied to technology development - is how a research approach can be produced and implemented as a product of consensus effort. Each firm in a consortium can have very different views of who the researched are, and what they

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[83] This is not only a problem for new media. Apparently it is a common problem for VISA transactions and Reward Card data as well.

[84] Erick Brethenoux, research director for advanced technologies at the Gartner Group, Paris (as quoted in Gerber, 1996)

[85] The Five-Stage Process of Implementing Datamining (ibid.):

1.Select and prepare the data to be mined.
2.Qualify the data via cluster and feature analysis. Clustering and segmenting data reduces complexity in order to manage the data to be analysed.
3.Select one or more datamining tools.
4.Apply the datamining tool to achieve knowledge discovery.
5.Apply the knowledge discovered to the company's specific line of business to achieve a business goal (i.e. to make more money).

would like to know from them. This raises substantial problems in producing a relevant and coherent research approach, again with dangers of 'overloading' research participants (again this is something which is dealt with in more depth later in Chapter 7). This is an important aspect which lies at the core of the CU approach - that it is important to understand use from the design perspective, as much as from the distribution and end-user-consumer perspectives. All these contribute aspects of what the product essentially 'is'.

There were two most obvious stakeholders with respect to knowledge concerning the usability of the system. First were the hardware developers. Next were those developing the content material. The usability of the remote control was only relative to the usability of the on-screen controls and nature of the content material. This suggests that usability research on one aspect of the technological system - in this case the remote control - was dependent on the various characteristics, attributes, features and functionalities of other parts of the system - i.e. the nature of the content material. This will, in turn, have implications on the choice of method, as well as separating out data most relevant to those involved with hardware or content design, as well as perhaps some general design rules governing how they interrelate and combine in the interfaces.

Chapter discussion

In the 'information' age, there is a real value placed upon knowledge. Knowledge has been to a large extent reified in many discussions during the 1990s, both in academia and in the private sector, regarding what it is, how it should be identified, stored, and applied. But it remains that competitive advantage is being built on the ability to constantly collect new information and process it meaningfully, i.e., to digest it and create new knowledge.

This new knowledge must then be transmitted throughout the firm (Imai *et al*, 1985; Takeuchi and Nonaka, 1986; Nokata, 1991; Nonaka and Takeuchi, 1995; Leonard-Barton, 1995; Spender and Grant, 1996; Sweeny, 1996; Teece *et al.*, 1997). Amongst

the various kinds of knowledge flows within and without the firm one remains of clear value - the ability to know one's customer and what they might do with one's product and service.

In proposing a set of principles – contextual usability and sociotechnical constituencies – for conducting and evaluating interpretative field studies proponents of interpretive approaches may view a violation of the emergent nature of interpretive research, while others may think just the opposite. In this debate I adopt a middle, and what may be considered a pragmatic position. While I agree that interpretive research does not subscribe to the idea that a pre-determined set of criteria can be applied in a mechanistic way, it does not follow that there are no standards at all by which interpretive research can be judged.

Research practice, considered as an act of communication, transfers and translates relevant (or in some cases non-relevant) data and information regarding a phenomena, from the site of occurrence or perception, to interested 'others'. It is a process of reification, where data and information converted to knowledge; "by transforming the recipient's state of knowledge, information turns into knowledge – as matter may convert into energy." (Ingwersen, 1992: p.126) Brookes (1981) also uses the physical metaphor when he proposes the field of *informatics* as *the* fundamental social science. He regards knowledge as "information as that modifies a knowledge structure in any way," and defines a knowledge structure as "a live, information-seeking entity always striving to modify itself to be in a dynamic equilibrium with the information it is receiving." (p.21) Orna and Stevens (1995: p.16) suggest that: "the essence of the searching and investigating that goes on in research is *transformation*." They also indicate that this process requires a blend of craft and science, in that two distinct modes of thinking must be employed. This communication may manifest through interactions with the physical product itself (i.e. arising from situations of use), the wider social systems which enable it to deliver service, or through the myth-making and cultural connotations that surround it (i.e. through advertising, or being attributed with a certain cultural capital, as a subject of standards). As Neil Postman has it:

> "to a man with a pencil, everything looks like a list. To a man with a camera, everything looks like an image. To a man with a computer, everything looks like data." (Postman, 1993: p.14)

Sys-log data, apart from detailing single-person households can only provide reliable usage information at the level of the household. While it is easy to capture data, as it is an artefact or by-product of system usage, its meaning is questionable and may be the subject of conjecture by those who 'wish to know'.

By reducing 'noise' in the data, for instance mitigating from the analysis inaccurate button presses, or what may be a young child repeatedly pressing a button etc., can allow for some reasonable conclusions regarding choices to be drawn. But it remains that what can be inferences is limited by what is shown, what there is available to interact with, and so such data cannot properly serve to guide innovation of service and system. In the cold light of day it remains that this is still aggregate statistical information based upon the availability and selection of pre-defined choices.

The notion of innovation in content is a goal and challenge to the establishment of a new medium. For instance this enters into the argument put forward by the BBC when they justify the licence fee through their production of advertisement free 'quality' television. For anyone who has visited the US, comparisons between the quality of the BBC and advertising intensive commercial television in the US are obvious. And no channel, regardless of the ratings would choose to screen, even if it were possible, non-stop versions of the soap operas which currently dominate the ratings of broadcast television. Very much analogous to the manufacturing sector the notion of 'continuous improvement' must allow for a free-market ethos of change, variety and choice, as part of the environment which lends value and meaning, *context* to a product, and the act of viewing, using or consuming. But the dominant logic of mass media mentality applied to the new interactive forms, still dictates that there is 'one best way' which can be found out through the technologising of audience research. These technologies are a form of husbandry of consumer-users, and this was very evident in the approaches adopted by the working group responsible for

user research on the trial.

System-logging is potentially a powerful means by which to capture use and usage data. It is gathered at a premium by web companies who, like the television networks, wish to verify their 'hit rates' – the amount of times web users come to their sites. And as with television such data translates easily into advertising revenues. But how much time do people spend on their computers compared with watching television? How many people are accessing the web compared with watching television? Television's mass market potential is again raised, but this time with respect to developing consumer-user intelligence. Encountering and tackling the issues of exploiting sys-log data, provided the chief motivation for the private sector social research agency to get involved in the trial.

The ubiquitous television set will have a connection to someone else's computer. Is this an invasion of privacy? Burke (2000) suggests a dystopian view where i-Tv creates 'experimental conditions' in the home:

> " . . . machines that control your TV set will show you something, check to see how you react, and then show you something different. That's not just convenient. It's a loop of stimulus, response and measurement as carefully designed as those boxes where rats hit buttons to get food and avoid electric shocks."(p.6)

In this chapter I have argued that we need to move away from the prerogative of categorising and labelling people, and to properly consider the relevance and place of the types of knowledge and understanding firms are after, and the ends they will serve. This inevitably implies that we need to re-consider our own role as researchers. Biases and preferred way of knowing should first be made explicit, so as to begin to speak a new language in which overt subjectivity, rhetoric, argument and metaphor play a central role.

Approaches such as critical phenomenology, naturalistic inquiry, and hermeneutics begin to address some of the dilemmas that were raised in the present study. I have suggested that these approaches maintain elements of action research and

phenomenology that use qualitative research methods (such as field research, descriptive research, and ethnography), in which the role of observer/participant and interpreter was played out. Contextual usability in this sense was the explicated pre-[understanding] which guided the case study interviews. Research becomes more than a data collecting activity, in that it actively seeks to understand as well as to improve the product, its various social constituencies and organisations, through simultaneous action and reflection with all parties involved. A researcher has the moral obligation to work for and with the participants in his/her study in order to justify his/her presence in an innovation project. Design evaluation research should have a pedagogical end in the sense that the participants somehow benefit from the research. If it does not, is it truly 'good' design? Research should not just be an attempt to learn about people, but to come to know with them the reality of products and services that supports and challenges them as they go about their daily existences.

The methods employed in this study had to constantly adjust to the exigencies of the trial. Of particular note here was the constantly evolving technical potentials, its problems, as well as my relations to its stakeholders. The methodology also evolved to cope with developments in the theoretical and epistemological aspects of the study. There was constant appraisal of the most relevant way to extract knowledge out of the dynamic conditions of the trial.

There are many problems which are bound to plague 'real world' research projects. As research tends to 'smooth out' and make coherent aspects of what can appear as the chaos of the 'real' world, likewise theory "is supposed to be a guiding light that orders observations and imposes pattern on a overwhelmingly complex world" (Poole and McPhee, 1985). Unlike the controlled conditions of the laboratory, research within firms, or within people's homes is subject to a variety of influences and mitigating factors which can obfuscate and confuse important events and occurrences. Many of these may have more importance to the design of a technology than what may be hypothesised, or understood by the frames of traditional marketing or usability research.

Pragmatically, a contextual inquiry of domestic technology use invariably entails some form both of smoothing (chaos of the real world setting - gaining access, commercial sensitivities, acquiring trust whilst maintaining an ethical position) and looking for patterns. It inevitably involves field work, either visiting peoples homes, conducting interviews in the company premises, visiting i-Tv installations in museums, and taking part in round table discussions (all of which were undertaken in the present study). While this can be privy to the widely understood problems of implementing fieldwork generally - i.e. subject, time and resource management, logistics, and other factors which can 'mess' things up, such as restrictions due to commercial sensitivity of the subject, it remained possible to some aspects of the unexplored territory of domestic use of new media.

The underlying ethos of the present study was exploratory. Interpretative research such as ethnographies are holistic and contextual in that they seek to place observation and interview data into a larger perspective: "A central tenet of ethnography is that people's behaviour can be understood only in context; that is, in the process of analysis and abstraction, the ethnographer cannot separate elements of human behaviour from their relevant contexts of meaning and purpose." (Boyle, 1994: p.162) But ethnographies can consist of a blend of both positivist and interpretist approaches, working in tandem to permit insights to the use process. The table below outlines how experiential qualities may be mapped in a contextual usability study (see table below).

Table 4.2 Components and attributes of CU

	Who	What	When	Where
use	Gender Age Status Relation to other household members* Technical proficiency (VCR, Computer etc.) Level of Technological/ computer Anxiety IQ Personality	Current media tastes (print and electronic) Attitude to technology (particularly domestic technologies) Media technologies individually possessed Access to household media technologies Anticipation's of i-Tv system's features and functionality	Usage patterns of media consumption Overall leisure activities (focusing particularly on the position of media in context to other activities)	Where current media technologies are used
usability	Which type of person finds the system easiest/ hardest to use?	Is the system easy to access on initial confrontation? What role does attitude to technologies affect usage?	Does lifestyle and leisure patterns affect usability?	What role does the location of use, have on usability?
usage	Do individual differences relate to styles and patterns of use?	How is usage of the system affected by domestic sociology (including , social dynamics, censorship and rules concerning use)?	What is the play-of between leisure activities, hobbies etc. and use of the i-Tv system?	Do certain locations lend themselves to the formation of particular usage patterns?
usefulness	Which type of person derives the greatest benefit, satisfaction and enjoyment from the system?	What is the perceived value of the i-Tv system compared with the other pursuits?	How does the use of the i-Tv system develop and change over time? How does it develop with the addition of a new service on-line?	How easy on initial confrontation (i.e. point of sale) with the system is it to assert usefulness? Will certain services be more highly valued in certain places (i.e. word processor in living room, VOD in bedroom etc.)?

*apart from using self-report methods to assert previous media exposure habits

** assuming for instance, that the individual is a member of a household consisting of more than one member

In addition to the examples mentioned above, such as limitations of the demonstration Set Top Box technology[86], and desires to maintain commercial secrecy, there are particular human, social and cultural factors which dictate their own variety of problems hindering the flow of constructive knowledge from trial enterprises. The selection and use of a relevant subject sample for laboratory-based usability testing, or indeed a user analysis, of a new spreadsheet package may be meaningfully conducted with a random sample of spreadsheet users. They are inherently a select and distinct category of users who can easily compare what they know of a previous version, or similar product, with what is presented to them. Their experience of using dictates their predilections to what is different, what may be valuable, desirable, useful.

Nevertheless the testing of what may considered as more radical innovations often lack a suitable, clearly distinctive or even reliable existing user-consumer base. This makes it much more difficult to incorporate 'average' users or consumers, in order to suggest user- or consumer-centred opinion on perceived value, added advantages, improved qualities, increased performance, and/or enhanced modes of operation and attractiveness.[87]

Conversely, technologies enjoying wide diffusion and use, such as television, as well as the attraction of manufacturers of consumer electronics towards new products for the mass market, pose a particular problem for testing. Particularly the notion of choosing a sample.[88] Should such technologies be dedicated and designed for use by ***any*** television user? Or will separate functions of interactive television services, for instance games, education programmes, be dedicated to a certain age group with

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[86] I was given a demonstration set top box which was 'free-standing' - it produced its content from a hard drive. It was capable of only offering limited links and avenues via its menus. It did however, act as a functioning prototype which could be used for the purposes of usability testing .

[87] This aspect of innovation has produced the largest problems for processes such as QFD, where the prescribed methods of attaining the 'voice of the customer' rely on them distinguishing qualitative differences between new product lines and categories from those under development.

[88] I have not discussed the process of sampling here but it is an integral part of many [experimental and survey] research projects, and possesses its own set of methodological problems.

cooking programmes, DIY etc. dedicated to another? The testing of such technologies becomes more problematic depending on who is chosen to use; which particular functions; and which particular content material. Making television interactive may mean very different things to different people. Television as it already stands, and which will be further explicated in the following chapter, does not necessarily have a fixed place, a fixed set of meanings in lives and homes, and certainly not meanings directly predicated by demographics, or socio-economic indicators.

Adopting a very broad outlook we may suggest that use orientation and function of television is different within people's lives than, for instance, their use of computers. For the most part, and relevant to the sort of discussions in this chapter, the use of television is for entertainment, leisure and relaxation, its use is less focused, and may be watched in a non-specific way. Alternatively, the use of computers tends to be very task orientated, very specific and very focused. The notion of what people 'do' with media information is elusive, non-testable, difficult to qualify and quantify.

However, it remains that one may easily register use in the form of the pushing of buttons, navigation etc. - through a networked system. Such registration may provide for which household switched on when, what they did in a session, interpretation of such data is incomplete without some perspective of what such use *meant* during the session. How this may relate within the contexts of the consumer-user's other tasks, activities, pastimes, beliefs, tastes, attitudes etc. The on-going debate in computer supported co-operative work (CSCW) tends, as does much HCI studies (including Contextual Inquiry) towards how the system may genuinely enhance social tasks and functioning, as well as how the system acts as a suitable medium for communication. This is something that may perhaps be measured purely in productivity terms, but ascertaining how 'entertaining' or 'absorbing' a programme is presents a much deeper problem of interpretation.

The use process provides a crucial pivotal point in the analysis of the appropriation

and consumption rituals and habits which form through and around the use of technologies. It provides analysis for the meanings that a technology evokes throughout its creation and domestication. While working on the premise that technologies do not fall upon us from Mars, that being the products of shared social, cultural and economic contingencies, contextual usability should offer some explanation of what drives and encourages their development and use. The use process may be broken down into elements which define appropriation, consumption (purchase), consumption (use), negotiation (shared use), and interpretation (of content).

The use process is also a mosaic of developmental elements that define and shape, usage patterns, an expertise of use and ability to use, attitudes regarding the usefulness of the product. A focus on the social, behavioural, cognitive and cultural factors influencing (or equally, not influencing) use carries something of the notion of the 'everyday'. It also caries over the idea of making the unusual (i.e. the new product entering into the arena of a person's everyday life) into the usual (a product which has successfully meshed into the affairs, routines, tasks, and requirements of quotidian life). As such, CU encroaches upon a number of existing and emerging research areas which have developed theories and research methods regarding product use and consumption. In particular, recent developments in consumer psychology, media and communications studies, audience research and cultural studies can now offer relevant insights into use processes. These methods now often feature the inclusion of more new paradigm social perspectives on product-user-consumer integration and can extend knowledge of product over that generated by the normative quantitative research paradigms of traditional marketing, consumer research and usability engineering.

Conclusion

In an age when the user is becoming of greater focus to producers, creators and manufactures of content, technologies and services, it remains that there must be some degree of innovation of methodologies aimed at enriching understanding of the

user-consumer. Brown *et al.* (1989) argue strongly that knowledge is situated, being in part a product of the activity, context and culture in which it is developed and used.

It seems reasonably clear that beliefs, attitudes and perceptions are best explored through the more interpretative 'new paradigm' research approaches, whereas actual consumption and use behaviours are best illustrated through the emerging technologically enabled means of tracking use. Put together such a combined approach should enable more accurate and broader understandings of what people are *actually* doing with the systems, and what this *use* means within the broader context of their everyday lives.

It is the basic premise of this thesis that such multi-method research is the obvious answer in exploring the use of on-line interactive media. However how these methods are employed and how they and their results may combine in an informative way still remains a problem. It has been recognised that: "Researchers in management of technology often seek to frame studies that simultaneously address practical issues and more general questions of interest to academic colleagues." (Von Hippel and Tyre, 1996) This has been long recognised as a problem within the social and human sciences generally. The splits between those advocating one particular method over another and confuses the potentialities of combining methods under a broad theoretical 'pigeon holing system'. CU focuses on the event and situation of use. It aims to create a 'meeting place' where various data may be brought together, where case study - may draw upon different modes of inquiry (i.e. sys-log, evaluation research) to create 'thick' descriptions.

PART TWO
CASE STUDY AND CONCLUSION

Chapter 5 – Acorn and their technology

"Built by engineers, used by normal people"
(Hewlet Packard advertising statement)

Introduction

This chapter focuses on a study of ***Online Media*** (Om), a division of Acorn Computers Ltd., and the project which came to dominate their activities – ***The Cambridge Interactive Television Trial***. Several interviews were conducted over the period from the firm's inception in July 1994 to the time of the completion of the trial in April, 1997. Several visits were made to the companies HQ in Cambridge Technopark, where managers and designers were interviewed, present ideas on user-research and take part in user meetings. These formalised interviews are augmented with various informal communications, e-mails, and appropriation of company literature such as operating manuals, press releases, and web site details.

The focus of this chapter is mainly upon the technology, software and interface development. The following chapter focuses more strongly upon the development of content and services – the 'culture of production'. While constituting a somewhat artificial split in the development of a new medium (as in an analysis of the development of television set technology considered separate from the broadcast program making), this chapter reiterates an important point of technological development - that new innovations invariably often rise out of previously existing components, expertise and knowledge. Out of various kinds and levels of social and technical interaction: come iterations, paradigm shifts, innovations or 'bifurcations'. These in turn drive the need for further technologies, social contingencies and/or knowledge.

This chapter does for instance include reference to the development of the user interface. From a design perspective this is the site which straddles the realms of content and hardware. I have already suggested that this is a site of intense activity, both in design and in use. It represented one of the key areas that demanded attention when the technical and creative elements were configured. It is interesting to note that in this case new forms of expertise were deemed desirable, arising out of a distrust of the efficiency and effectiveness of the initial, spontaneously developed interface design. A 'graphic designer with HCI experience' for instance was seen as

desirable for revisions to the look and feel of the interface. While this is a hybrid expertise which is only now being incorporated into traditional graphic design courses which are inevitably becoming more digitally orientated, at that time - 1995 - finding such a person posed a significant problem. Motivations for this recruitment were entirely an internal decision by the company and not based on any form of user-consumer feedback on the performance or style of the interface.

The Cambridge Phenomenon: The environment of Acorn

The 'Cambridge Phenomenon' is the title for the explosion in small high-tech firms starting up in and around Cambridge leading up to and throughout the 1980s.[89] The growth of these companies was matched by the attraction to the area of complementary business/financial services and specialist R&D operations of big companies based elsewhere. The area has proved a breeding ground for high technology entrepreneurs (Segal, Quince and Wickstead, 1985). This led to the tag of "Silicon Fen", due to the similarities with Silicon Valley, just as "Silicon Glen" represents the high-tech industry in West Lothian, near Edinburgh. In each case a strongly-scientific university community is on hand to supply ideas and personnel to those companies participating in R&D.

Acorn

Chris Curry and Hermann Hauser founded Acorn Computers Ltd, in Cambridge in

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[89] The Cambridge Phenomenon is characterised by Segal, Quince and Wickstead (1985) thus;

- The presence in and around Cambridge of many high-technology companies (computing, biotechnology, electronics & scientific instruments mainly).
- A very high proportion of young, small, independent and indigenous companies and a corresponding low proportion of subsidiaries of large companies based elsewhere.
- A long record of high-technology company formation; Pye, Marshalls, Sinclair, Acorn.
- A tendency for high-technology companies to concentrate on research, design and development rather than production.
- The many complex direct and indirect links between the companies and Cambridge University.

1978 originally as a microcomputer consultancy. Their very first products were 8-bit microcomputers for scientific and technical applications and an electronic pin ball game. By 1980, Acorn introduced the *Atom*, one of the first home computers aimed at a family market, and which was sold via mail order. A notable feature was a video interface allowing it to use a TV set as a monitor.

The financial success of the *Atom* drove Curry and Hauser to seek further funding for development work and production and the following year they won a contract to produce the *BBC Microcomputer*. The *BBC Micro* is rated as one of the biggest success stories in British microcomputing, selling more than a million units over its working life of well over a decade. Its main market was education and it achieved considerable penetration into UK schools and the higher education sector.

Production on the BBC Micro started in earnest in 1982, when it could boast a processing speed twice as fast as its nearest rivals, yet was cheaper to buy, and it included many standard features which were expensive options on other computers (including, again notably, an adapter for Prestel and teletext). In 1984, Acorn went public, and entered the pioneering multimedia arena as one of three partners in *The Domesday Project* - a prototypical large scale multimedia project with partners Philips and the BBC Interactive Television Unit.[90]

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90 It is interesting to note that the Domesday project was finished in 1986. The BBC Domesday System comprises an extensive amount of both social and geographical information about the UK. Its most valuable resources are the Community Disc and the National Disc. The Community Disc provides information about places in the UK like city and environmental maps, detailed descriptions of the facilities you can find at these places, and it gives you the local history of your area of interest. Sometimes you can even find interviews with local residents. In addition, you can easily switch between functions and sometimes call up photographs of landmarks to be found at these places. On the National Disc you will find socio-cultural, cultural, economic and historic data about Great Britain. The overall concept of the disc is that of a gallery in which you can stroll, but you have the alternative option to call up specific data with the index and find functions. The National Disc also provides a vast fund of photographs that cover areas as different as the marriage of the Prince of Wales and Boris Becker's first victory at Wimbledon in 1985. With the Master AIV (Advanced Interactive Video) system as a major component. The groundbreaking multimedia content was supplied on two 12" double-sided laserdiscs and included images, text pages, video clips, data sets and computer programs - the full range of multimedia material. However Philips intended to make a mass produced machine by which the video disks could be viewed - this never materialised.

The RISC PC and the RISC OS

By the mid-1980s, the computer industry was generally migrating from 8-bit computer systems to 16-bit architectures. In 1985, Acorn produced its first 32-bit RISC (reduced instruction set computer) microprocessor and took the lead by entirely skipping the 16-bit processor generation. When *Archimedes* - the generic name for the first ARM-based machines first appeared, it was the fastest microcomputer of its time. This precedent continued with the advent of the RISC PC in 1987, followed by the development of the RISC OS operating system in 1988 which featuring a `Window, Icon, Menu, Pointing device (or Pull-down menu) - WIMP (*windows, icons, menus and pointers*) based graphical user interface. In 1989 and 1991, respectively the BBC A3000 and A5000 RISC micros were released, the later with performance equivalent to 486 PCs. In 1992 Acorn won their second Queens Award for Technological Achievement for creating and exploiting the ARM processor. Initially the ARM chip was developed by Acorn. It was further developed in collaboration with other EC partner organisations under the aegis of the ESPRIT *MultiWorks* project. This culminated in the delivery of the ARM3 chip. In November 1990, ARM Ltd. was formed by Acorn Computer Group, Apple Computer and VLSI Technology.[91]

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91 As of 1998, ARM's current market focus was upon three main areas of development:

- **Embedded Control** - i.e. mass storage, security, automotive and instrumentation to printers, Smart Cards, modems, and communications systems, Consumer Multimedia and Portable Systems.

- **Consumer Multimedia** - i.e. digital cameras, game machines, digital TVs, TV set-top boxes, intelligent terminals, and GPS (global positioning satellite) devices. Examples of multimedia products include Oracle's *Network Computer*, Wyse's *Winterm400* series network computers, Online Media's set-top box, Viewcall's *Netsurfer* and Teknema's *Internet TV* set-top box design and technology suite.

- **Portable Systems** - i.e. handheld PCs, PDAs, pagers, cellular phones and the emerging crop of smart phones. Apple's *MessagePad 2000* and *eMate 300*, the Psion *Series 5* handheld computer, Geode's Cell- Phone Modem and Spyrus' *LYNXS* Security Card, all contain ARM chips. Also within this category is OMI-***NewsPAD*** , a collaborative development which involves the Technology Management and Policy Programme - TechMaPP - from The University of Edinburgh. ARM continues to work with projects in the EU.

The RISC PC - had it a market?

While the Acorn RISC PC had significant advantages over its competitors in terms of specifications they could not derive the economies of scale enjoyed by the PC makers. This is reflected in its relatively high price.[92]

Sam Wauchope, the then Acorn managing director, made a statement to the effect that with the maturing of the traditional personal computer market, Acorn's strategy would be to take their technology skills and develop them in faster-growing sectors of the market; this was envisaged as i-Tv. The intention was to invest £13m, raised by a public flotation, over three years in Online Media.[93] One of the conditions for the capital was that Online Media should be accepted in interactive TV trials.

Wauchope envisaged participating in six more tests around the world over 1996. The feeling was at the time that the demand for set-top boxes would start to rise considerably as from 1997, when sales of the 'set-top box' were predicted to run into the 'hundreds of thousands'. Positive cash flow from the Om experiment was not expected before 1998. Wauchope was aware that the group might not be able to go it alone at these levels, which would be driven by expansion into the Far East or USA, which would demand that they find a right partner, rather than funding it themselves.

On the 29th July 1995, just over a month after Acorn issued a profits warning, they made a statement that its personal computer business was continuing to experience 'difficult trading conditions which will again adversely affect results'.[94] That year, however, they had produced some 80,000 machines. However, their market niche, predominately the UK higher education sector, was drying up. Money for upgrading computers were low on the agenda in budget-strapped schools. In short, the RISC PC

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[92] The middle-of-range RISC PC (4Mb+1Mb, 210Mb, 14" monitor), circa 1995, cost about £1400 pounds +VAT at 17.5%., which compared to a similar performance PC was very expensive (top of the range non-Pentium PCs were currently offered as low as £500). Also Acorn's US market was very little or at all developed. Both hardware and software are exceedingly difficult to get hold of, even though they boasted that the RISC PC was launched with over 3,000 software applications already available (through backward capability to run already existing RISC OS software).

[93] Source *Financial Times* 23rd Feb.1995 'UK Company News: *Acorn calls for £ 17.2m*

was not selling anything like the numbers that had been anticipated, and this placed further emphasis to diversify Acorn's operations and top explore new market opportunities such as i-Tv.

The organisation of Acorn

Acorn as an organisation is constantly evolving as a structure as well as constantly changing personnel. As indicated earlier, being located within the thriving environment of the Cambridge Phenomenon provided them a rich environment within which to develop and network expertise, as well as recruit personnel. Acorn personnel and managers were directly involved in building many of the local high-tech companies, and had developed strong links with other organisations in the area, including The University of Cambridge.[95] However as of 1995 it had several operating divisions, employing approximately 130 people, and which are linked through their exploitation of RISC technology. *Om* was designated the role of developing and managing products and services in the interactive Television arena. The Acorn *Network Computing* division is devising and producing the Reference Designs for Network Computers for the Oracle Corporation. Acorn *RISC Technologies* designs and licences technology to partner companies in the USA, Korea, Japan and Europe.

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94 Source *Financial Times* 29th July 1995 'UK Company News: *Acorn chief resigns* '

95 In the Dec. edition of *Personal Computer World* the notion of the cross-industry academic links were emphasised by Alec Broers, Cambridge University's new vice chancellor. He is reported to have emphasised that in the face of massive government cuts, the university has to build new bridges with industry and get its know-how out there earning good money.(source -'Why all IT roads are leading to Cambridge' *Personal Computer World* Dec, 1 1995) Interesting to note at Acorn was there was a considerable 'recycling' of personnel with Acorn start-up companies and other firms in the area. Many people had previously worked at Acorn several times. In-between these contracts they had worked elsewhere and had since returned.

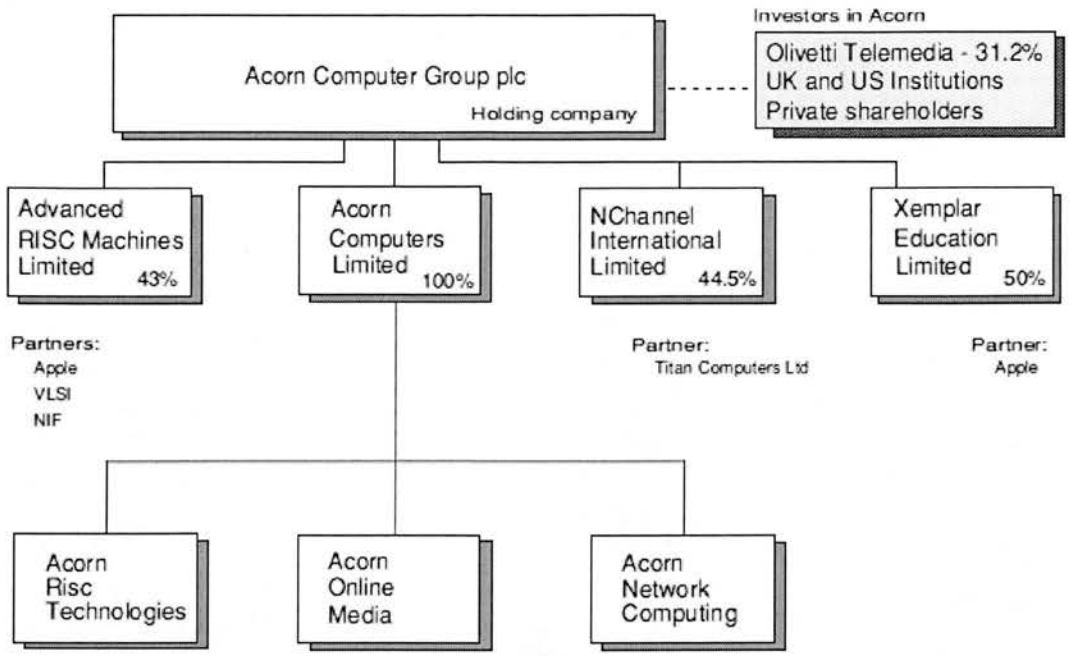

Fig. 5.1 The organisation of Acorn circa. 1995 (courtesy of the Acorn Computer Group plc)

The above diagram shows the relationship between organisations associated with the Acorn Computer Group plc and its operating divisions. Since autumn 1994, the Acorn stake has come under the umbrella of a new subsidiary, Olivetti Telemedia, which groups together all the Italian company's multimedia interests. As of 1995 Olivetti was looking to Acorn to help it take advantage of forecast growth in multimedia systems and services, with Elserino Piol, the vice-chairman of Olivetti, appointed chairman of Acorn in November, 1995.[96]

Acorn Online Media -The genesis of the Cambridge Trial

Acorn's interest in interactive television was generated much earlier than many people involved with the project knew. During a trade show in 1993 they were originally approached in early 1993 by representatives of *News Datacom*, a

[96] As the diagram shows, Olivetti Telemedia are currently the largest investor in the Acorn Computer Group, with a 31.2% shareholding. Acorn Computers Limited is part of the Acorn Computer Group plc, which went public on the USM in 1983. The Acorn Computer Group has a 43% shareholding in Advanced Risc Machines (ARM) Limited; a 44.5% shareholding in NChannel International Limited, a 50% shareholding in Xemplar Education Limited, and has 100% ownership of Acorn Computers Limited. Acorn Computers Limited is currently made up of 3 operating divisions: Acorn Risc Technologies (ART), Acorn Online Media (AOM); Acorn Network Computing (ANC).

broadcasting systems developer, best known for their development of smartcard-based scrambling systems for *SKY TV*, and closely tied to Rupert Murdoch's *News Corporation*. The result of this meeting was that senior Acorn personnel had a number of meetings internally between themselves, and then with representatives of News Datacom where they discussed the potential of Acorn's RISC technologies for i-Tv. These discussions acted as a focus for development trends inside Acorn:

> ". . . obviously Acorn is always looking for new machines . . . new markets so this was a potential we wanted . . . we internally thought that our technology was very well suited (to what News Datacom required) and had a lot of strengths . . . our machines were very programmable in terms of a video system so it was easy for us to generate very good TV signals . . . we had a lot of software technology such as the RISC OS which good do presentation on a standard television much better than the average computer." (Sonya Tagert - Acorn Chief Scientist)

This relationship with News Datacom lasted for some time, acting somewhat as a 'carrot for technology development' at Acorn. There was no fixed contract cited, but rather a kind of loose relationship, where Acorn remained confident that they were on the cutting edge of STB development. News Datacom were remaining open to alternative STB solutions, moving between R&D departments of companies the world over evaluating technologies (possibly motivating others to work on other projects?). The firm's history (specifically their successful relation with the BBC with the micro) already suggested the kind of markets that could be built through collaborative efforts with large media organisations.

News Datacom's interests lay in the advent of digital television that was clearly on the horizon. They were aware of the need to be ahead of the field with respect to their satellite and television activities through SKY. During the period of the Cambridge Trial they continually returned to Acorn indicating that in their opinion Om had the superior technology for what they had in mind for the future.

This relationship was first in a number of encounters that would shape the directions and product of Om. Towards the end of 1993, Acorn started to put together a specific

system, and started investing in relevant specialised technologies such as external digital video de-compression hardware. They already possessed considerable experience with digital video software through previous work done on the RISC PC, and the BBC *Domesday Project*.

1994

By early 1994, the year US vice president Al Gore announced the 'information superhighways'[97], the fledgling Om required more personnel as they were now building very specific hardware dedicated to the STB. With an initial team of twelve, mainly drawn from Acorn's technical expertise (including its technical manager - Dave Swallow, and senior technical designers) they identified the actual engineering that lay behind the creation of set top box 1 (STB1). STB1 was to act as the blueprint that guided Swallow in his choice of expertise and technology. Swallow was clearly the major influence - the project champion or constituency builder (i.e. Molina, 1989; 1990) - co-ordinating relevant staff and expertise for different features and functionalities of the box:

> "[Dave Swallow] had been a technical director . . . makes sense regarding why it actually happened . . . [Dave Swallow] basically hijacked people who had been working at Acorn who'd been working on the RISC PC, or [Barry Holstein] had been working on the Kryton project which is the replacement for the low end machines and that's where the casing design came from . . it was all kind of like everybody was brought in with their different bit, with what they'd done." (interface designer)

Progress was to move fast on the development of the system. What was noticeable was that there was from the managerial perspective a definite and conscious blending of the social and technical elements contributing to the creation of product. Those whose expertise lay on one particular part or aspect of the STB were drafted into the project *in concert with* their 'different bit'. The box itself comprised of what was available 'off the shelf' from other projects that were being worked on at that time Acorn. The specification of these parts dictated the initial conception, design and physical shape of the initial prototype, with some level of inventory or stock

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[97] *Financial Times* Sept. 19th 1994 'Plugged into the world's knowledge'

awareness (of components and sub-systems) coupled to project-management aiding decision-making regarding the selection of parts and people. The heart of the system was the RISC PC, and the ARM microprocessor.

The core group of people that were needed for the original development work became what was the fledgling Om (or *Spinner* as it was originally named) in March/April 1994 - a team of around 15. This team included a couple of hardware designer/engineers, a dozen software engineers, project managers, and technicians. As the technology and business developed others were recruited to fill noticeable holes that were appearing. Some of this expertise had to be drafted in from outside Acorn, particularly for specialist aspects of the technology such as the video systems. At the time of the interviews (June,1995) Om personnel had risen to around 40. This represented a dramatic rise in personnel within a year, and described by the hardware director as 'frightening'.

RISC PC and the hardware of the STB

As previously indicated, prior to the inception of Om and the STB, Acorn had already developed (but not fully realised or manufactured) the RISC PC. The RISC PC was the dominant technical inspiration of the STB, forming the blueprint of the system. It had a printed circuit board (PCB) which more or less met with what was required by the specifications. *Falcon* was another project that was running concurrently at Acorn. It had a case roughly in the right size and shape that was needed, so that was commandeered as the case for STB1. There was a power supply unit (PSU) that was in an early stage of development which was also needed for Falcon. This was completed and also incorporated into the STB. The most significant difference was the inclusion of several cards which would permit MPEG decoding, a network card for ATM, and another card for infra red (IR) control.

Some of the designers were aware that the Apple STB (used on the BT trial in

Colchester[98]) had used a stock case, and so they understood that Apple had also cut corners by scavenging off shelf components. At this stage one of the biggest problems that the team had was being able to create a design of an MPEG card by which to fit in a box which had not even been moulded yet, and operate to the specifications of the machine. A Sunderland-based company - *Wild Vision* - provided the essential video card technology, and Acorn software engineers spent considerable time developing appropriate software to connect it.

Evolution of STBs: configurations of technology, expertise and luck?

Barry Holstein summed up his perception of the evolution of STBs and their enabling technologies;

> ". . . STB's have a natural progression. They progress from things that have a CD-ROM in them to things that have networks in them . . . what we're trying to do is actually move material up and down, masses of information into user's premises. So this is an excellent way of getting yourself started, getting all your software in place, being able to mix audio, video text, graphic, pictures, you name it via the CD drive while the networks aren't there yet, because to support this level of technology you probably need something around a two megabyte a second interface which is roughly what you get with a CD-ROM. But of course this sort of communication network is just not available and it just so happened that ATML was in their first network strategy on ATM and it was based on a two megabyte per second link."

The functional definition here was then, that what they were dealing with was actually a multimedia platform, which would be networked, using a high bandwidth - broadband - communications link. This placed new needs on extraneous technologies (communications system and network card) which had been developed and were available locally (through a sister company). The supply of a two megabyte per second signal was critical for VoD using MPEG.

Barry Holstein saw that it "was all slipping slowly into place." This emphasised his

[98] BT's trial of video-on-demand in the homes of 70 staff living near the BT Research Laboratory at Martlesham was based on ADSL (video over the copper telephone line) technology. This trial ran almost concurrently with the Cambridge Trial. What is less well publicised is that some of the homes are connected by fibre and that BT is as interested in testing the conceptual approaches to service development as it is in trialing the technology. BT's earlier fibre-to-the-home technology trial in

view that luck entered into the equation of design forces, however he did recognise that "lots of people were working towards the same end." In other words ATML were aware of exploiting their technology towards such an end, and there had existed some realisation and understanding (obviously at Bird's 'inventory' stage) that the technology could match the specifications. Barry Holstein went on to link the notion of convergence between companies orientated in terms of the technological capabilities of the STB:

> " . . . STB is about three different groups of companies. It's talking about the consumer market, the televisions and all the rest of it, its talking about communications, the telephone networks and its talking about computers, and they're all working towards the same ends really, and that's when these three meet you get STB."

A further focus was communications. An obvious choice was a local company - ATML - with strong connections with Acorn (Herman Hauser, a founder of Acorn and who remains one of the directors) who were early proponents of ATM networks which were considered to be the most likely network interfacing protocol on the market for broadband communications such as was intended for the Cambridge Trial. They also happened to have produced a network card that fitted into a RISC PC board, so that was quickly commandeered and incorporated into the STB. ATM as the communications link further focused the orientation of the project:

> "ATM networks were talked about from the beginning because . . . one reason would be ATML . . . because we had close links with ATML . . . the buzz was that ATM was going to be the high speed mechanism needed for [the high bandwidth traffic] . . . certainly we concentrated a lot in the early days on the ATM technology . . . these days we don't think twice about demo boxes with hard disks in that sort of thing, but in the early days we very much concentrated on ATM, I think it was may time we actually set up a link, we had a RISC PC server down at ATML, down at Mount Pleasance, and we got Cambridge Cable to make up a fibre link up to Acorn House and fed it to the boardroom, and the idea was we basically plugged it in . . . and put a little set top in the boardroom and had it booted off this RISC PC the other side of Cambridge . . . it was all very primitive stuff but it showed the technology working . . . the STB had a hard disk in it as well though, we'd run all the screens and the MPEG would be played off the set top HD, but the files would come over the ATM, we hadn't got the sound working yet, we couldn't stream sound we were more interested in video at this stage . . . nobody

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Bishop's Stortford ended in 1993.

> actually commented that we didn't have any sound, they never actually realised that we didn't have any sound coming over the ATM."

Demonstrating the box to members of Acorn's board illustrated to top management that the project was technologically feasible. It represented a significant constituency building opportunity, which, regardless of its functional pitfalls, was a sure example not only of Acorn's ingenuity but also the suitability of their technology for this purpose. Support for the project at this level was imperative, as there was to be some significant investment to be made on development of the product before revenues were to be drawn. Barry Holstein alluded to the fact that overall Acorn did not have clear ideas on where it is going, suggesting that they are perhaps more opportunist than entrepreneurial:

> "You've got Acorn who doesn't quite know where its going, by that I mean its always been very strong in the education market. Its tried other opportunities both overseas and consumer business and never really succeeded in either. It's education department, or its education market, but that's going nowhere because the education budgets keep getting stripped. So you've got Acorn looking for somewhere to go."

The early prototyping and development of the STB appeared to be fuelled partly by luck, the right time, the right person, and the right parts. However, it took industry on the part of the team to gel the various hardware elements to work together. It was also going to take money. It is interesting to note here that the demonstration was the Trojan horse by which the project was kick-started within the company. It captured the imaginations of senior management enough to get support for the project.[99]

It was clear that this was the impression from the technologist's viewpoint. This had televisions as symbolic of mass consumer markets, and considered television as a technology, not a medium. Like television, the STB, the demonstration machines and

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[99] This process of using demonstrations parallels the stories of Alexander Graham Bell when he went 'on-the road' with his telephone apparatus, of Edison with the Pearl Street generating station, and of Baird with his various demonstrations of early television in Selfridges department store. Each of these were essentially demonstration pieces designed to create the constituency, or to propagate interest and funding for further development work. As in the case of these early projects, this first demonstration piece set its own trajectory of development within Om, one which would lead to an almost independent avenue of demo box development, apart from and separate from development of 'actual' boxes for the Cambridge Trial and other uses.

the Cambridge trial all demanded content and interfaces through which to be appraised and operated. This created the need for further expertise and for further development.

The development of the interface

The same team responsible for producing system software which would link the various cards and other technology to the motherboard, had the concurrent task of developing software and screens which would provide some comprehensive indication of what an i-Tv service would look like. This was the genesis of content and what was to become a semi-autonomous operation within itself - the generation of a succession of stand-alone demonstration boxes.[100]

Previous to this point they had been writing very small programmes to show specific aspects of the system. An Acorn marketing manager had previously worked with a company called CADSOFT Ltd. that created presentation materials on Acorn computers. Under tight conditions of secrecy, Om commissioned them to do the first presentation demo of the STB. They put together a few screens, and while the result was considered positive, the resultant demo looked much more like a computer than interactive television. CADSOFT Ltd. had been chosen for designing the screen layouts. They had considerable experience of using TV screens for their presentation work, however, due to the high level of secrecy involved in the project some level of misinterpretation had taken place:

The demo was to essentially show the STB working, to present the opening screen and the various menus. The problem was that it was mouse operated, and the screens had been produced from an authoring system which was still under development which was extremely demanding in terms of computing power - it needed in the region of 16MB of DRAM, 2MB VRAM. This outstretched the capabilities of the Om box which was only going to possess 4MB of DRAM, and no VRAM. Some contingency was obviously needed here due to the technical limitations of the system,

the job was passed to two of the designers, Interface designer and Chris Marshall. They worked on the IR and the problem with memory, and eventually came up with a software design which displayed a series of JPEGs according to a series of key presses.

Meanwhile another engineer worked on the MPEG hardware (the card from Wild Vision), as well as writing the software necessary to play MPEG. The real problem at this time was how to link it all together and actually show as a unit what it would do, all operated by an infra red remote control. The CADSOFT demo was never completed as Acorn withdrew payment for them to do so. However, building on the work which had already been done Terry York - Interface Designer and another software engineer developed the user interface which characterised the first operational interface. They acted as interpreters and implementers of ideas which derived from feedback from other engineers, managers, etc. They had the CADSOFT demo as an initial working template and this provided the main idea for buttons and some of the backdrops;

> " . . . we thought right the first idea was to get their demo working in our new environment we've created, the idea was to get their demo and stick it in, and we did that within a week and we had it working, we had the IR working it was all there...the idea was we had to sort of develop from there trying to improve . . ."

The blue backdrop (which featured on many of the screens) was a CADSOFT development however the original buttons were yellow and they had an icon-based system that represented the service. The buttons were also dead (they did not function) and it showed lists for movies rather than the small pictures which characterised the final product. A further problem was the slow time it took to shift from one screen to another. They saw that they needed a click and some actions of the screen - a sound icon and some sort of visual indication that the system was responding. This required that the sound players which would play any sampled sound which had to work on the RISC PC.

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[100] These were basically STBs whose content provided by an internal hard-drive instead of a network.

They eventually found one but could not find any samples for it, so they ended up with the one sample that they had - a sound which sounded like a foot loudly crunching on fresh snow. As a prime example of how usability parameters are not fixed, but are dynamic and can change and evolve over time, they worked with that sound for some time before it became too irritating. They then managed to change it to a typewriter click. This was coupled to the idea of highlighting the button - you pressed the button and it sinks down slightly - this made it possible to see it better. By developing a fade between screens during shifting developed the illusion that the speed between screens was quicker. One of the designers developed the design of nine buttons indicating the nine options.

> "He went round and found some nice pictures and stuff and scanned them in...he did that and it kind of stuck...and we modified the other screens to kind of look similar...we started putting drop shadows on things and certainly any numbers we had we than put drop shadows on."

One of the major problems, and one which was to later have crippling impact on the Cambridge Trial was that Acorn had a priority authoring application for developing the STB content. During the early days of development a number of Acorn titles, i.e. the game *Technodream*, which had been developed for the RISC PC . . . and included this on the menu of the demonstration STB. This carried the implication that there was a whole library of games available on-line. This was intended to be a strong selling point. One of the shortcomings of the Apple STB was that it could not run games. BT were concerned about this, as they were very much wanting to test i-Tv as a consumer market, and realised only too well the commercial potential of games. Om wished to create the impression that there was this catalogue of games ready to provide on-line playing. However this was misleading because many of these games were not anywhere near running on the system. With work they could get them running but they wished to hold back on precious development time until some concrete proposal came forward which would merit work.

> " . . . To be honest its just a big con, the RISC PC hadn't been released and we had about 200 games in Acorn the consumer unit which had copies of all the games...and basically I sat down for a couple of days just testing them and getting them to run on the RISC PC, because if it runs on the RISC PC it will

> run on the STB we found about half a dozen which would actually run without crashing . . ."

They were designed to play via a keyboard or a mouse and had menu options at the beginning which were inappropriate for STB presentation and use. Another problem was a lot of games often do not quit properly making it difficult to get back to the desk top, the only way you can actually get out of them is to reset or reboot. This would be a very negative option for STB use on the trial or with a demo. Through default they ended up with *Technodream*, the only game which would work with relative ease and reliability. A further problem, obvious in the operation of games designed for keyboard use, was that had keyboard instructions - 'press z for left' and so on. This was converted into word keys - on a main menu you press escape to get out of the programme and to get back to the desktop. When the game is running you press a different key, and the key 'normally' used for returning to the top screen took on a different function.

York felt that clients would be impressed when they would see the relatively large selection and choice of games, but understood little of the amount of 'hacking' it took to get one game working. There were similar problems with the educational material, which had been designed for use with pointers and mouse. As a small team, which had to produce things really quickly, they did not have the time to go round to companies and to sign agreements and pay them to rewrite source code. It was more realistic to 'top hack' something and get it get it working the next day. Using third party developers for material in the early stages did not merit paying for development time. Producers of educational material were not interested in changing the format of their material (say, from CD-ROM to STB compatibility) because there was no immediate financial incentive. While it may be advantageous and a necessity to show-off technology to third-party developers, it is difficult to sell the idea of them producing material unless there is a revenue ready customer base.

1995

On the 30th March 1995, Peter Bonfield, the then chairman and chief executive of ICL (Now Chairman of BT) switched in the server for Phase 2 of the Cambridge trial. The intention was that Phase three would develop out of this towards the end of the year - when the trial would go commercial. STB 2 was finished around March. Most significant was the 1995 business plan being made, not by orders of ATM switched interactive television STBs, but STBs with modems (Viewcall) and those with CD-ROMS (Lightspan). These contracts significantly altered the development dynamics and strategy within Om. They placed great pressures on the Cambridge trial to become an autonomous entity within Om.

Meanwhile, the design team - consisting of three technicians-engineers and a project manager - were turning their sights from the problems of building an operational system to becoming very conscious of usability. Interface designer for instance was originally given a job at Acorn concentrating on evaluating the RISC OS interface - ways to improve it for future versions. This included looking at the interface to see what could be done not only to improve it, but also how to incorporate new ideas for the system. This work was to influence a different release for 1995, so they had about a year to conduct their project. Much of it was based on comparison of RISC OS with other systems; Windows, Macintosh, UNIX, all the different X Windows, etc., cataloguing what was good and worked, and what was bad and inefficient, what RISC OS were missing and what it was lacking. It was a bench marking type of concept that was used to generate ideas.

There was many ideas being generated within the company. The design team also talked with repair, DBU - the educational unit, the customer services people who deal directly with users as well as going out to places where users were situated, particularly with educational centres around the country such as schools. Some local schools were directly involved in testing for the product. They spoke to some third parties, such as software developers and others developing hardware and software for the machines.

This wide and varied means of deriving product feedback was bringing to focus some generic problems which were emerging from the conversations. They realised quite quickly for instance during their field visits was there was the great need for printing options. Supporting print has been one of the biggest technical problems Acorn has had for a number of years. One of the team was going to look at printers, understand the problem people were having with them, and improve it. Another, more technical member of the team was going to do the necessary programs, he had been the main developer of the RISC WIMP. His job was to develop windows and graphical interfaces. The other technician and the manager filled in any gaps by doing 'bits and pieces'.

One issue that arose, and one which is a tenet of usability engineering is *consistency* (e.g. Wiklund, 1994, Neilsen, 1993). Interface designer took it upon himself to be responsible for ensuring consistency in the interface;

> "I was really quite keen [on usability] because I knew nobody was interested...I had been working on this thing for a year, it hadn't...it had gone somewhere but we hadn't produced anything...I thought we've got all these things we've learned, we know what we can do lets make sure...I'll make my job to keep it all consistent. . ."

Whereas during the RISC OS project the usability team would report 'well its not that easy to use' Acorn managers and other creative staff would retort 'its always been easy to use' and 'make it easier'. The atmosphere was described as one of 'fighting all the time' At Om however, there existed opportunities to voice opinions and also to suggest entirely new ways of doing things, 'that nobody's done before'. Rather than this climate being symptomatic of a 'permissive' and 'creative' atmosphere, it was suggested that it came about through default. Everybody at Om was so busy nobody had time to criticise, leaving room for artistic licence from the usability-design team. With one person or unit 'in charge' of design lay open the possibility of implementing usability knowledge and laying down certain criteria which could be kept consistent.

> "I could actually go in and bear in mind at all times that every scheme that we did there was some reason why we were doing it...I could actually spend hours going through all the screens and looking at each one and picking even

little things out which weren't quite making for a more consistent flow."

Interface designer picked the font and style of the screen text and maintained this across all the screen headings. The positioning of certain pieces of text, such as that indicating navigation were kept consistent. The main usability focus was on consistency, however a large degree of attention was paid to complexity, particularly making sure that the navigation was balanced and natural. Navigation is balanced when one does not have too many links and avenues down one side of the 'tree'. The idea is to spread out from the link that's chosen. Only features that are accessed a lot should be at the higher levels. Also when on an unfamiliar screen it is important that when you press a button you know what is going to happen.

When the original screens were created, Dave Swallow approved the design and endorsed that this particular style be used in all the screens. New features or content were added as ideas emerged from all members of Om. The usability-design team collected ideas from what everybody in Om were trying to do, or by feedback they would give through discussion. While the influx of ideas and comments can lend to a useful exercise in innovation, too many comments coming from too many diverse questions can amount to chaos;

> "I mean things happening all over the place and you really didn't know where something would come up next...and you just had to...[Dave Swallow] would come along and say 'well, look we need a game or we need . . .' Anglia came long and said 'here's some of our CDs put some of these on' and things like that...sort of keep things on there and add things as they come up. . ."

The task of the usability-design team was to marshal these ideas, implementing them in terms of a consistent presentation. More than this being simply aesthetic and ergonomic in nature it also required the technical skill of building in top level compatibility with the system as it was developing. The work paid off, in-company feedback was positive. People were saying that it looked good, and felt really easy to use. The team felt like that they had done a really good job, however they felt that 'it was kind of like you really, don't really, know why'. This doubt that appears strange in the light of the conscious application of usability knowledge was really focused on

aesthetic concerns.

The 'social constructivist' approach to screen development was a problem. Also the insular attitude of the design team, patriotically in their struggle with the 'outside' criticism of their work, perhaps worked against them criticising each other:

> "Each person was doing their own thing they felt like they could put their bit in and I think it became difficult because we never really sat down and said what we were going to do...and I was kind of taking control of it and so when we had these screens appearing it was 'yeah, but its not quite what'...I don't mind, its difficult because you can't tell somebody you don't want their input because there's nothing wrong with their backdrops there actually quite nice we'd rather use them but it's the different style."

There is some suggestion that towards the aesthetic side of design process the certitude of 'proven usability research findings' fell away to the more subjective 'free for all' of the artistic and creative domain. This undermined any claims to an overarching intelligence, focus and logic which should govern the look and feel of the final product. It became a matter of expressing opinion rather than suggesting the application of a definitive way of doing design. Under reflection and analysis the final product, and indeed its success was somewhat put down to relatively arbitrary causes, this developed insecurities rearguing the integrity of certain decisions. However, through learning from people actually using the system, some important lessons were also learned.

> " . . . we've got no reason to say that these blue backdrops were the best backdrops to have...those 1 to 9 labels best to use, but that's kind of well that's what we're going with therefore we stick with them...when we were developing at the time we had situations where we have a screen with menu 1 to 9, and behind that we'd have games at 1.0.6, and we only have 6 now. . . for some reason the games logo seemed to be long and thin, it was stretched to go on there...basically we thought we'll have them 1,2,3,4,5,6 . . . and we got feedback saying 'look hang on, it looks really strange looking down the left hand margin and going 1,3,5, and its not really quite clear...so we swapped them round and went 1,2,3,4,5,6, and it was still not very clear because it should have been 1,2,3, - 4,5,6, but even so it was still felt that it wasn't quite right, it didn't feel right and that's hen we eventually went to 1,2,3,4,5,6, basically its all to do with the button layout on the remote...this was eventually designed for people to move round with the arrow keys, but nobody used the arrow keys because it was too difficult...it was more of a sort of that sort of thing, if you want something you just press the number . . .so

> therefore, we basically found that if you're going to do 1 to 9 you got to have them in order 1 to 3, 5, 6, . . .we kind of learned from people using it, which was the approach we did."

The people using the system were company personnel as well representatives of the technology partner's personnel. For instance when the CT began with Phase 1, it included Interface designer as a participant. When he returned home one day and switched on the system he realised that, from his sitting position in his living room he could not read the text.

> " . . . the text wasn't big enough, I was sitting on my sofa and you couldn't read the typeface...partly it was to do with the dark I mean all these backdrops on here are faded out slightly as well...because it was too bright there's too much pasture in the white in the backdrop...which you won't notice if we watch it here [points to screen] but as soon as you're sitting in your front room you couldn't actually read it...that's an effort that we made...maybe I just noticed and I just changed it...and nobody said 'oh, you've changed the backdrop' because they never even noticed but its those kind of little things that go on in the evolution of the product, something that nobody even notices."

This is directly representative of a technical contextual usability problem realised through situated use of the system in the home as opposed to on the workbench. This realisation led to them considering their development of an American NTSC version of the STB, due to the inferior quality of the display. Size and resolution of text was an important factor to legibility of content. Realisation of these problems and other issues such as copyright for graphics brought to the fore a need for new interface expertise, a person that had graphics expertise bounded with HCI knowledge. While it was possible for the existing staff to grab screens and text from ITN news or other broadcast information, creating icons, which would be Om's intellectual property, was outside their present skill. The interface as it stood had plagiarised visual information from a variety of sources, all of which could have some copyright claim against the company. They needed someone who could design buttons with original icons.

With the addition of such expertise, Interface designer's position evolved into being entirely responsible for demos. The incorporation of an 'expert' in interface design

was not entirely welcomed by those who had previously been responsible for interface issues.

> " . . . you sort of think 'what's going on'...Nigel did some screens in a week, it was kind of like, yes they were fine but also loads of rules were broken...the rules which had been set up for our demo...nobody had real written...I hadn't written them down...but all of a sudden the screens were altered....he done one where, the news screen and there was going to be BBC and CH4 and ITV...while we go into different types here there was an intermediate screen which had different producer news...well there was a small logo down the bottom there and I thought why that?...because it was never written down there were no style guides, no standards...how its worked over the last year and half I've put something together virtually therefore I've been in the background all the time saying there's got to be a reason why its different...OK if you're going to have different shopping screens and there's going to be a style or when Acorn do their production lines over the system 'well that's you're area, you leave that and you do you're thing there' well its a different backdrop."

The development of demos

What was evolving was a tension between demo development and design and the design of the interface, and other technologies for the actual trial. This arguably marked the beginning of a separation between demo development specifically for demoing, and a separate development strand for the CT. It also suggested that something of the importance that was realised in some quarters of Om that the main screens, the visually generic part of the system should remain consistent and stable, though its polluting with the multitude of styles and operating principles which were to be developed by service providers.

Much of the learning regarding the interface remained tacit knowledge. It was true that some aspects of the interface were developed through default or artistically-subjectively-spontaneously nothing had been formalised or written down. No official guide was developed, as was developed for instance for the Apple MAC. More than that there had been no formalised user-interface meetings.

Insecurities also registered regarding how 'good' screen design influences sales:

> " . . . the good that happened was that the user-interface was strong and you don't know that what you've done sells those boxes...I mean we took a demo out to the states, the standard sort of demo and we got this big order how much of that was influenced by the fact that they really liked what we had done on the screens...you can't evaluate it there's no other way."

In 1996 Acorn developed the networked computer out of the STB design. This was in internet access device which used the television as a screen. In September 1998, Acorn announced that they were withdrawing from the desktop PC market, and concentrating on set top boxes for digital television.

Conclusion

As a tool of analysis, sociotechnical constituencies considers why a technology 'is as it is' at a certain time within its development cycle, and how it reached this stage, and relies on some understanding of where its origins lie, both from its technological and social perspectives. The acceptance and domestication of such products are also conditioned by a complex of influences including such elements as the symbolic attributes of the product group. These symbolic elements are afforded sense through the propagation of myths - utopian or dystopian discourses, marketing and PR, and moral panics (via marketing and/or press reports). These always accompany products in their diffusion through to consumption and use (see fig. 5.4 below). Further, there are the tensions and resolutions regarding how these are situated within the pre-existing networks of social and technical relations and use functions within the household, as well as lives, lifestyles and everyday practices of potential consumer-users.

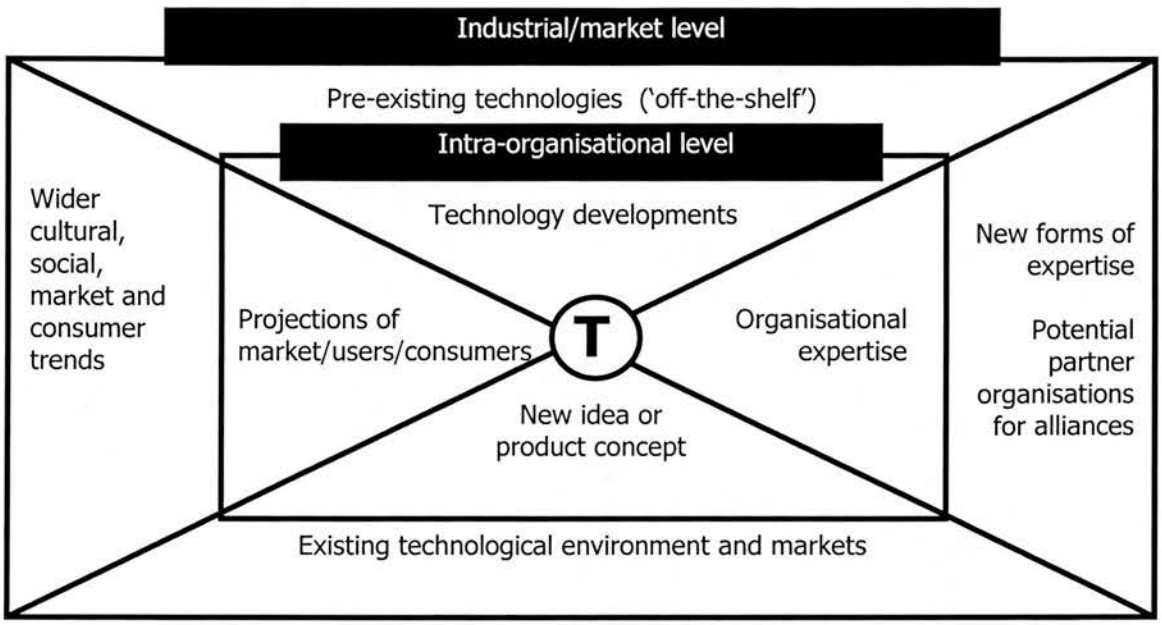

Fig. 5.2 The sociotechnical constituency at the genesis of a project

Applying the above model to the Om case described later, the pre-existing technologies were the RISC PC developments (motherboard, ARM chip various prices of software), *Kryton* project (casing and power supply), ATM network card etc. The technological developments included software linking the various component parts together, work on the infra red controller, the interface, and the memory. New forms of expertise included specialist software and hardware technical personnel, who were added as the project gathered momentum. Partner organisations included the companies who were involved with the system technologies, and those who later came in as part of the 'service nursery' – a term coined by Om managers to refer to the 'safe environment' where content and service providers could learn about the potentials of the new technology. The product concept was fuelled by the companies' involvement in other technologies. This drew attention to the technological potentials of their equipment that led to the genesis of the project (new product concept). And last, it was felt that the time was right for such a technology, and that there was indeed consumer demand for such systems on a very large scale.

It should be stressed here that these events or components of the constituency were not only dynamic, but also interactive and interrelated. For instance, the need for technological development (understood by the 'gaps' in the system when it initially ran) drew partners (SJ Research to augment the technology of ATML). Pre-existing Acorn technologies, such as their presentation software - fuelled the initial interest of News Datacom, which in turn was the initial spark which directed the entire project. News Datacom had obviously interests in such technologies because of their feelings that there were to be radical changes in the media marketplace, which would demand new technologies and expertise and so on. Each element links in a logical way with the other in the analysis of a given technology development situation.

There are several points or themes that are of particular interest drawn from the story of Om's development out of Acorn. Summarised these are;

- The obvious configurational nature of the Om product and the development process. At times it was difficult from the outside perspective to say what the Om product actually 'was'. Its apparent 'openness' to interpretability was something which became recognised as a strength rather than a weakness - particularly when Om made their 1995 business plan selling non-ATM, non-MPEG decoding boxes to Viewcall and Lightspan. Such events destabilised internal interest in the trial, and in general company orientations.

- The distinct design environment in which Om designers worked, including something of the particular design logics (as opposed to user logics - suggested earlier) which were apparent in Om.

- The compromise which lies between creating a product which has industry wide compatibility, while capitalising and maintaining the innovatory identity of the product. For Om they wished to create a product whose technical specifications concurred with the maximum amount of standards and conventions. However, they wished to maintain aspects of the system (i.e. Acorn proprietary authoring software and OS) which would require either the purchase of RISC PCs and/or consultancy for any serious content and system architecture development work.

- The use of demonstration technologies as catalysts for funding opportunity, project acceptance at the level of the firm, and the wider market of potential client organisations, service providers, and third-party developers.

- The sort of relationships, which are happening within the sector - i.e., an unpacking of the so-called converging alliances of technology partners.

- A striking example of how design processes which are divorced of end-user-consumer input can lead to changes being made by the firm which may lead to less effective and systematic results (i.e. the value placed on attracting a 'hybrid' expertise to create new interfaces).

- The spontaneous and more intuitive way in which results were found, and how these came to be seen as lacking value and need of a fix (such as importing hybrid forms of expertise to upgrade the interface).

- The ruptures between marketing and product development within a company culture dedicated to maximising growth, manifested partly by numbers of personnel (i.e. more marketing personnel than technology developers) and due to lack of understanding of competencies and capabilities (of marketers with respect to technology development).

- There seems to be some contention with respect to what the Om product actually was. The STB was continually evolving with respect to user needs and requirements.

An important point which I would like to draw out was the separation of development activities between technologies for the Cambridge Trial, the production of demo STBs for business visits and trade shows etc., and the alteration of boxes for clients needs. Each of these required, and received portions of the development activity at Om.

Each strand of development work carried with it different communication potentials. The Cambridge Trial evolved from its inception, quite obviously, into a much more explicit PR exercise. Its operation and the publicity drawn from showing the demo boxes had driven interest from a number of companies to Om's STB, and particularly to its attribute as being a cheap alternative to a PC. As Gregory (1965: p.16) noted: "Design is concerned with making things that people want; with building up patterns which have value." The original intended features and functionalities (i.e. MPEG decoding for VoD, and ATM networked) which differentiated it from the PC, and accented within the Cambridge Trial publicity, probably epitomised the kind of elements these companies wished to cut back on. Also, the interactive industry as a

whole was moving towards (cheaper?) alternatives for delivery of services - such as digital satellite (and also ADSL was not being discounted).

It would appear that the design team, or no one else for that matter, manifested knowledge of other interactive television trials, or even of competitors STBs. They were strong in knowledge, however, regarding more immediate innovations in component technologies, and in terms of more general innovations such as digital television. One of the few direct comparisons that were conducted was with satellite decoder boxes, as benchmarks for the robustness of consumer electronics. This was important for realising STB manufacturing and production specs. They had also bought a couple of CD-i players, and a 3DO machine to see what components they used with a view to keeping costs down. Much of this sort of benchmarking was Hardware designer's responsibility.

The interface layout and design was entrusted to a third-party developer, CADSOFT Ltd.'s. And some of the failure in communicating the functionality of the i-Tv concept cast light on the potential problems of communicating the ingenuity and potential of the system to other players and organisations. Also, varying commitment, self-interest, and potential benefits influence the relationships within inter-company alliances, as well as colour the visions and perceptions of the successes and failures of trials. Cambridge Cable, whether through being an active operation, already with a subscriber base and a revenue stream, placed an altogether different premium on i-Tv experiments than did ICL, ATM and Om.

However, there were also problems within Om itself regarding the agile and responsive nature of the Om product development process, responsive to feeds coming from the marketing division. The product development manager expressed his reticence with the relation of the sales and marketing team making claims to potential and actual clients that were difficult to manifest in terms of technological development capabilities:

> "One of the flaws in this organisation, which I've expressed at several instances is that we have a commercial group which decides to go off and try

> and sell product, no matter what. And I understand that, especially in the lack of number of sites where trials are taking place and all the rest of it and you have to commit to things that you normally wouldn't commit to, or things that aren't quite what you're doing. But what there never is then is a reality or a feedback to somebody in engineering about what it is they say they're going to be able to do. There's more a commitment on the commercial business to say "Well do it and then it gets thrown into the pile with the rest of it in the belief that everybody can turn circuits and actually make things happen. That's one thing that I'm actually disappointed with this place (Dick Francis - The Product Development Manager)."

Regardless of the attitude that there was some non-alignment of sales with development, others felt that the sort of relationships that existed and the way in which business was done was the right way;

> " . . . Its all very well launching a company and then saying year later here's our first product . . . what we wanted to do was launch on July the fourth . . . launch with a product which not only looks like something but it actually does something as well . . . so that the aim from the very early stages, from about April, was to produce something we could launch with as Om . . . so they said start putting something together for that . . . there was lot of problems going on . . . for example we had problems with the box taking two or three minutes to actually start up and things like that, there were all sort of configuration things going on we didn't really quite know how it would all work, we were learning as we were going along."

This mode of working - learning as you go along - has been variously referred to as 'learning by doing' (Arrow, 1964, and more recently Rosenburg, 1982 with 'learning by using'; and in relation to problem solving in Von Hippel and Tyre, 1995; and 'learning by trying', Fleck, 1994,' learning-by-interacting' Andersen & Lundvall 1988). MacKenzie and Wajcman (1985: p.10) described this as "feedback from experience of use into both the design and way of operating things."

One aspect of the technology development which could not be learned by trying was the development of the chipset for the second Om box, whose development was began before the trial, and essentially Om began. Other problems lay in the particular configurations of the STB components themselves, and the STB itself as a component technology of the whole system.

Another important point was the way in which changes were made to the interface. The interface development was viewed by management as an arbitrary affair as compared to the technical specification of the box components. Perhaps this was due to, or a symptom of, the artistic or creative content which shapes how interfaces look, feel, sound, and operate. Lab-based usability testing 'freezes' a situation of use in time, in order to evaluate the features and functions of a technology. However, the design process looked on as an iterative process - where iterations can take seconds, weeks, months and even years - is also a process of developing usability from the designer's perspective. The example of the sound, initially deemed useful, and latterly deemed a 'nuisance' is a sure example of how even from a designer's point of view usability, or the utility, or even appropriateness, or affability of a designed feature can evolve over time. This raises an immediate question, is this same for users?

Within the technical environment there seems a tendency to rationalise developments. This may be due to the way in which increased specification (often symbolised by numbers) is placed against economics (symbolised by figures) before any creative work is attempted. When work is done it is to accommodate the physical, electronic, or functional aspects of the increased specification into a technology, which is built, of existing and potentially parts that physically, electronically, or functionally do not fit. In many ways such an outlook seemed to be applied to the drafting of personnel, and the appraisal of the creative/artistic elements of the interface. Management rationalised that if a 'techie' could 'knock-up' decent interfaces, someone with a hybrid experience of HCI and graphics would be able to create something even better. Such an attitude was similar in respect to the development and building of the content and services capability outline in the following chapter.

A final point which is perhaps not emphasised in the interviews, but which Hardware designer made a comment (the 'alarming' rise in the number of staff), is worth mentioning. On my first interview to Om's HQ, there was a large concourse which

looked somewhat empty. Apart from a large amount of packing cases, and several desks. Over the next year there was a continuous expansion in the number of desks and personal, and there seemed to be continuous installation work being conducted in the back ground, such as the fitting of wiring and cable. At its peak, the building was almost full to capacity, and then throughout 1996 began to dwindle. By the official end of the trial 'Om' had already moved back to Acorns main HQ, and the last contact phone call was with a single individual who had the responsibility for tidying up the remnants of the trial. As of 1997, Om still exists. However it is not a separate operating 'division' but rather a different 'hat' of Acorn. The development work, as well as the perpetration of visions, and the build-up of expertise, and its demise all happened within a 3 year time frame.

Chapter 6 – The Cambridge Trial and Service Nursery

"This instrument, television, it can entertain, it can inform, yes, and it can even inspire. But it all depends on the will of the humans who operate it. Otherwise it is just lights and wires in a box." Edward R. Murrow

Introduction

The previous chapter addressed the formation of Om out of Acorn, and the development of the STB, its interface, and initial attempts at content. This chapter addresses more specifically the development of trial itself, and looks at the way in which Om approached the development of content, and so focuses particularly on the perceptions of the senior manager responsible for the development of services.

The Cambridge Trial - the technology

The Trial's original objective was to explore the: "enormous new opportunities for lifestyle management offered by interactive multimedia, or more specifically, by interactive TV."[101] These opportunities would be facilitated by the provision of a range of services aimed at addressing specific aspects of everyday routines, activities and relationships.

As will dealt with in a later in the chapter, this aim cast many visions and visualisations in those involved in the project. These drove and shaped the development of the technology and services. A simple example, offered by the product development manager at Om, was home shopping of a 'generic shopping basket'. A standing order could be placed for essential items - washing up liquid, dog food, cereal etc. - this would free up leisure time for other, perhaps more enjoyable activities. Attached to this [consumer] vision was another addressing matters of a more logistical and supply nature. It was viewed that supermarkets, already distributed to suit urban areas, would reconfigure their ratio of warehouse/storage space to retail space. In effect they would, rather than places where people travelled to shop, act as warehouse/distribution centres for the home delivery of i-Tv ordered goods. They would increasingly adopt this role as i-Tv diffused into home.

The Cambridge trial was the showcase of Acorn's movement into the area of 'TV-

[101] Derived from Acorn's web site http://www.acorn.co.uk/aom/trial/phase3.html (update 28th October 1996). A press release of the time shows how others (in this case ICL) envisaged the lifestyle impact of this new technology.

centric™ technologies'. It ran parallel to the organisational development of Om. It was intended to show the possibilities and potentialities existed for i-Tv in domestic homes. The trial successfully illustrated both the competencies and limitations of Om and Acorn, their technology, and their ability to form and maintain essential partnerships.

As will be illustrated in this chapter and the next, the trial placed its own pressures on the firm, eventually calling for a need to make the trial autonomous, in both a development sense (particularly with regard to content provision) and an economic sense. The trial moved from being a concerted effort on behalf of the entire operation, to one which was the responsibility of a small group. There was a split at management level with some quarters of Om staff clearly for the Cambridge Trial, while others were clearly opposed to any more expenditure and development effort, preferring instead to concentrate on more immediate and less ambitious development opportunities. There were those that felt that without the trial, Om would have "nothing."

It was clearly, even by non-marketing staff, as valuable in drawing attention to the firm and its competencies: "its nothing to do with the fact that we have a STB, its because we have a trial where we can show it working in a real trial." (Terry York - Interface Designer)

While the original planned broadband services placed a strong emphasis on (the technically sophisticated) video presentation of on-screen data and information, what emerged by phase three was a (much less sophisticated) service. This was operationally and presentationally more reminiscent of using the World Wide Web through the television. This change in technical and operational orientation was related to a number of different organisational pressures on the business and technology to which Om were subjected.

CITVIC and the technology of the trial

As mentioned in the last chapter, Om received venture capital in spring 1995. One of the criteria in making the money available was for Om to trial their technology. As entry into the BT trial was impossible, and discussions with other companies who would stage trials were in an elementary stage, it became clear that the only way in which to fulfil the criteria for funding was to propagate their own trial.

By early 1995, the consortium (Cambridge Interactive Television Infrastructure Consortium - CITVIC) of technology partners comprised Acorn Online Media, ICL, Cambridge Cable and Advanced Telecommunications Modules Ltd (ATM Ltd):

- **Acorn Online Media** - set-top boxes and systems integration
- **ICL** - large-scale media servers and network management
- **Cambridge Cable** - the network provider
- **ATM Ltd** (ATML) - medium-scale video servers and ATM technologies

The Cambridge trial system configuration (at the time before deployment of what was eventually termed phase 3 - the NC) comprised a fully switched digital overlay Asynchronous Transfer Mode (ATM) broadband network designed around Cambridge Cable's existing fibre-optic infrastructure. This provided a bi-directional link to each user using optical fibre to the kerb and then standard coaxial cable - the type of wire used for television aerials - for the last few metres into the home. In the home itself, Om's intelligent digital set-top box provided the interactive interface via the customer's TV set. ATML's 155 Mb/sec ATM network Virata Switches route data to ATM access switches housed in existing kerbside cabinets in a fibre-to-the-kerb (FTTK) configuration.

The video server used in the Trial was ICL's large-scale Parallel Interactive Media Server (PimSERVER - which could support a user population of 7000 connected homes, with around 2000 homes accessing the service continually). The server is fully scaleable up to a multi-terabyte storage capacity, and serves all current users of the Trial with the same content or service simultaneously. Video servers and other

content servers need not be located centrally. High demand or local interest content and services are distributed at various points around Cambridge Cable's ATM network - and beyond - providing a highly responsive and manageable on-demand system. All the Technology Partners are actively involved in contributing to evolving standards through international bodies, such as DAVIC, DVB and the ATM Forum.[102] The Trial infrastructure was based entirely on European-developed technology and much of the equipment that was used was based on the low-cost, low-power consumption ARM 32-bit RISC processor, including Acorn Online Media's digital intelligent STB. Later SJ research, another Acorn-linked company entered CITVIC with particular expertise to augment ATML in the switching technology.

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[102] The **Digital Audio-Visual Council** (DAVIC) is a non-profit Association based in Geneva, Switzerland, aimed at promoting the success of digital audio-visual applications and services based on specifications that maximise interoperability across countries and applications/services. DAVIC is a strong endorsement of its vision of a digital audio-visual world, where producers of digital audio-visual content can reach the widest possible audience, users have seamless access to information, carriers can offer effective transport, and manufacturers can provide hardware and software to support unrestricted production, flow and use of information. Established in August 1994, the DAVIC membership currently includes more than 200 companies from more than 25 countries around the world and representing all sectors of the audio-visual industries: manufacturing (computer, consumer electronics, telecommunication equipment) and service (broadcasting, telecommunications, CATV) as well as a number of government agencies and research organisations.

The **Digital Video Broadcasting Project** (DVB) also includes over 200 well known organisations in more than 30 countries worldwide. Members include broadcasters, manufacturers, network operators and regulatory bodies, committed to designing a global family of standards for the delivery of digital television. DVB standards are developed for each delivery system, a set of User Requirements is compiled by the Commercial Module. These are used as constraints on the specification. For example, in the case of DVB-T, user requirements outlined broad market parameters for a DVB-T system (price-band, user functions, etc.). The Technical Module then develops the specification, following these user requirements. The approval process within DVB requires that the Commercial Module supports the specification before it is finally approved by the Steering Board.

DVB-compliant digital broadcasting and reception equipment for professional, commercial and consumer applications is widely available on the market, distinguished by the now instantly recognisable DVB Logo. Numerous broadcast services using DVB standards are now operational, in Europe, North and South America, Africa, Asia, and Australasia. DVB standards are open and interoperable. Following approval by the Steering Board, DVB specifications are offered for standardisation to the relevant standards body (ETSI or CENELEC), through the EBU/ETSI/CENELEC JTC (Joint Technical Committee), the ITU-R, ITU-T and DAVIC.

The ATM Forum is an international non-profit organisation formed with the objective of accelerating the use of ATM (Asynchronous Transfer Mode) products and services through a rapid convergence of interoperability specifications. In addition, the Forum promotes industry cooperation and awareness. The ATM Forum consists of a worldwide Technical Committee, three Marketing Committees for North America, Europe and Asia-Pacific as well as the Enterprise Network Roundtable, through which ATM end-users participate.

Cambridge i-Tv Trial Services

As detailed in the previous chapter, having eventually proven that the technology could be made to function reliably and consistently, the Cambridge i-Tv Trial technology partners looked towards providing real content and services on the network. This was achieved by attracting major media, finance, retail and distribution companies with interests in interactive multimedia. These firms were interested in the potential of networked multimedia, especially how it may affect, enhance and impact their business.

The enticement to participate was that the trial represented a safe, relatively low-cost environment for rapid interactive service development. The 'service nursery' comprised of a framework of systems and procedures established to make the process of interactive service development and evaluation (according to Om paraphernalia) as "painless as possible." It was further claimed that the members of the service nursery have derived extremely useful experience, data, relationships and international PR from their participation.

As of June 1995, the service nursery participants or **Principal Service Providers** (PSPs) included;

- **Acorn Computers Ltd.**
- **Anglia Multimedia** - part of the media group MAI.
- **BBC Education** - broadcaster.
- **BMP DDB Needham** - advertising agency.
- **Tesco Stores Limited** - the UK grocery retailer.
- **The Post Office** - world-class deliverer of goods and services.
- **IPC Magazines** - the UK consumer magazine publisher and part of Reed International.
- **ITC** - regulator and strategic technology developer for UK commercial TV.

As of 1995, the Cambridge Trial could then be roughly split into two separate constituencies; the ***technology partners*** - CITVIC, and the content and service providers - known as the principal service providers (PSPs) - who formed the ***service***

nursery (see below).

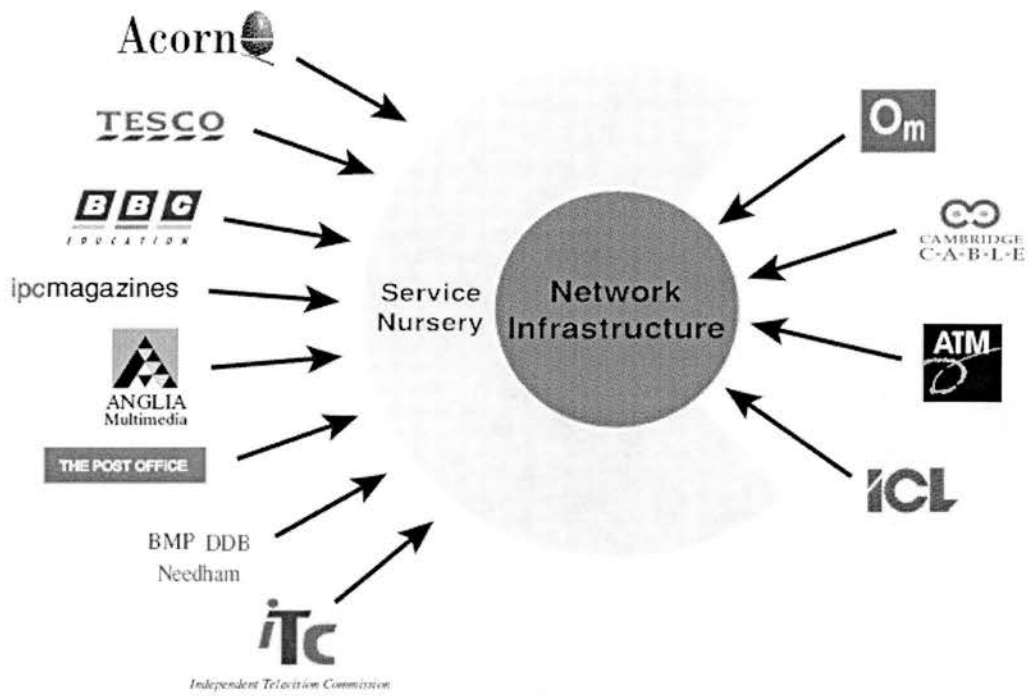

Fig. 6.1 The member firms of CITVIC (as of 1995) - Cambridge Interactive Television Infrastructure Consortium (inner circle) & The Service Nursery (outer circle) (picture courtesy of Acorn Om).

The development and thinking behind the Service Nursery

The person who was chiefly responsible for building the services and content of the system was Marcus Penny. He officially joined Om when it first formed in July, and moved into the Cambridge Technopark headquarters on the 1st of Aug, 1994. He had previously worked for Acorn in 1983 where he ran the personal computing development group. After joining PA Consulting he was involved in a number of domestic multimedia system projects in the late 1980s. One of the projects involved Shell, who placed one million CD-i players with telecommunications links into people's homes. Multimedia players with telecom links convinced him that such systems represented viable business propositions. This was confirmed by further work with Philips Corporate and the BBC Board of Management.

He was also aware of the technological capabilities of the Acorn group (having previously worked with Acorn):

". . . being aware of the technology that Acorn had and particularly the ARM processor that was a very low cost intelligent set of technology building bricks for constructing things . . . and being involved over the years in looking at ways in which that might be used . . . and I guess three, four years ago I became very aware that this opportunity [for domestic networked multimedia] was on the cards and it could happen particularly due the conditions in the UK being quite good . . ."

His feeling was that it was not only a technologically feasible project, but that there was now a market ripe for i-Tv-style services. However, he was aware that it would take much more than technical capabilities to drive a successful project. For instance, the BBC project showed that they were already developing interactive media through a dedicated department. They also had a number of other departments which were investigating or producing interactive material. It was clear that multimedia was going to become much more mainstream for them as a medium, and there was strong evidence of a number of different ways in which this would directly impact on existing core BBC activities. One of the aspects that PA was exploring was: Who exactly were the disparate groups who were working with multimedia within the BBC? The PA work with the BBC spawned a number of responses including the production of *The Net* (a BBC2 programme on digital culture and technology) and the *BBC Networking Club* (the BBC's Internet provision):

" . . . people like the BBC had seen the effect of digitalisation on the production part of the supply chain what we're not talking about is the effect on the delivery end which is actually even more profound, far more profound and it leads to a fundamental restructuring of the industry . . ."

In addition to the work at the BBC was Penny's involvement with the Federation of the Electronics Industry (FEI) in the UK. He had been leading the multimedia working group since 1992. This provided him with a rich variety of industrial perspectives with respect to how i-Tv would develop.

"I became aware quite early on it would not happen through any one organisation, but through a combination of things . . . and you really need a whole set of skills all the way down the value chain from the entertainment and service providers . . ."

Already clear from the Shell project were the significant business opportunities that

lay in the provision of services. However the wider industry perspectives were suggesting entertainment was the way to stimulate needs and demand. It also suggested the considerable technical problems involved in building a robust and reliable system.

Business Case for Content and Services

The Cambridge Trial required not just one piece of technology but a whole suite of technologies from the STB, to the network and server - a technological system (i.e. Hughes, 1983) - which all not only have to work on an individual level, but adequately work in concert. The Penny's view was that the technology was only one 'slice' of the entire project, "actually only the starting point." He was aware that there had been a number of exercises over the last ten years which had struggled to reach the point where it actually does work, and then had "it fallen down in heap."

> "OK we've got a technology to work, you know, why doesn't it go as a business . . . and I've reached the conclusion seeing several of these things set up and then fail that actually the key to this was taking the service perspective and getting that right . . . and that actually you have to the step of having the bits of technology to make it possible at all, but then once you've got that the way you've got to think about it to drive it is from the customer point of view what do they want, that you can deliver, at a price they're willing to pay. That's sufficiently different and new and I think that given the newness of what we're doing is actually a rather significant step forward . . . just more convenience of something we already do . . . "

A question remained concerning how could you make that work and then manage all the logistics of delivering it as a sustainable business? Penny viewed this as something where you have got to get the whole value chain working, so that everyone [each partner and consumer-users] could envisage a suitable reason for taking part. This required first and foremost desirable content, as well as the creation of content supply chains that contributes all the different bits of technology slipped together into an end-to-end solution. On top of this sits the whole service chain which included supply chains for the delivery of goods and services. He was adamant that it was the big picture - the entire constituency - which needed forming:

> " . . .what you are really talking about is the birth of an industry . . . unless it all works together none of it works . . . take what we've seen over the 10

> years, maybe 20 years is various false starts of bits of it . . . I think we're now just at the point where enough work's been done in all the different are to stand a chance of the whole thing flying . . . probably where the least work's been done, that's where I've been concentrating on, the service aspect of it . . . taking that particular perspective what does the customer want how can we deliver it regarding everything else including content and infrastructure and technology as a means to provide it . . ."

Over the previous couple of years, he had engaged in some conversations over with Acorn regarding new avenues that they could be exploring. He viewed this as a further influence in what cumulated as Om and the Cambridge Trial. These earlier discussions were with the then technical director at Acorn – and revolved around the opportunity he envisaged for a number of digital technologies which could be developed, particularly within the UK, regarding networked multimedia, personal digital assistants (PDAs) and other portable devices.

At this time the Penny himself was looking for a development environment that was prepared to be innovative, prepared to be forward looking, and was used to the idea of making investment in technology development. What was clear to him at this time was that the scale of changes with respect to the 'digital revolution' was such that you could not make an impression without making investment. There was not going to be any benefit without a company being prepared to putting in considerable time, effort and money.

From his consulting perspective he could see the changes that were happening, but intrinsically, a consulting organisation is not geared to investment. Meanwhile Om appeared to be looking for someone who had industry experience bound with a service perspective. He was enrolled into Om on that basis.

> ". . . since then I've been exploring, we've all been exploring what we do with the market how we make it work and understanding this complex questions of how the services part relates to the technology product part and how to make that work and what in a sense this example is . . . because that is perfectly understood in industry . . . the general industry perspective is this infrastructure and bits of technology and there's content . . . and to my mind there's a long history of people who actually succeeded in fighting all the barriers and all the difficulties that there are . . . there's many difficulties in

> bringing technology content together and it hasn't worked or its hasn't worked to the extent that people thought . . . Prestel sort of worked and found some niches like travel agents . . . but it was nowhere near the potential they thought it was . . ."

While Dave Swallow may be regarded as the product champion for STB, Marcus Penny may be considered the champion of content and services. Pragmatically, he would draw on his consulting expertise to work out how content and service development could fit into the general Om business case. This was problematic as it concerned what aspects of the product - services and technology - could be viable at this time; a stage in which any market for i-Tv was "very, very embryonic." Om were witnessing the opportunity to take its technology and produce a product - the STB - that would meet the market need, if it did exist or could be developed for i-Tv. His job was to anticipate, develop and forecast an imaginary market.

Impressions of demo

Penny had originally started these initial discussions regarding services and content provision with the fledging Om group in early 1994. This was when he first encountered the early STB demo. Unaware of it being a demonstration machine, he was, as was the Acorn management board before him, deeply impressed: "I thought, yes, that's actually what's needed to make this fly from the technological viewpoint." The key features he identified were the system's ease of use, its good usability. This was mainly in the user interface – that most public aspect of the system which represented the services, presented the content material and governed the way that people interacted with the system (and the major focus of HCI and usability studies).

> " . . . I think my subsequent perception of the people who had created it was 'here's a product, a piece of hardware . . . and this . . . what we've got here in the user interface is just a demonstration of what the hardware can do' . . . I think my feeling at the time, and I think its been born out through the conversations we've had . . . a key part of the value of what Om has, is the thinking that went into that user interaction . . . that's in a sense quite difficult to see because in order to see that actually has value, you've got to look at it from a services perspective . . . rather than a throw away piece of software."

The demonstration box convinced Penny that Om had indeed created something of

real value. Within it he saw a technological manifestation of his personal vision of what networked multimedia should be (this relates very strongly to how the actual features and functionality of a technology, congruent with anticipations, may enhance its value or symbolic worth).

Interface

According to Marcus Penny the original user interface developed by Terry York, was considered the "right expression" of the potential of the technology:

> " . . . my experience of innovation is often the things that somebody does . . . throws together in a couple of weeks because 'oh, that's sensible to do' . . . and that has been better than some of the leading players in the world has been recognised as the best example of a user interface that they've seen . . . and it was just, you know, somebody or a couple of people just put it together . . . part of the reason is that you are escaping from the mind set of previous development . . . and part of the key thing is you've got to make this work you've got to take the technology that's in PCs and bring a completely and different mind set to it . . . and almost everyone else . . . everyone else in the industry has got too much of the PC mind set or maybe its the TV mind set to actually see with a fresh look, oh this is actually what's needed' . . . I think that sometimes it a case that things are done and its not fully understood why they're done and once you've got there you may not do the right things to exploit it because you don't understand why its right . . . you need the fresh creativity side to create it and then you see around it the understanding from the business perspective is well the key elements in that is this, this , this and this for these reasons . . . and that may need to be from a different perspective than the perspective that created it . . . I think you could draw a map of how it happened I think in most cases it was not consciously managed . . . a few things that happened having in a sense happened by accident . . . I'm not sure I particularly believe that either . . . when you look at it from a full enough perspective . . . these were the things that were needed and different things and different people contributed and the whole thing added up and had a momentum of its own even though lot of the people involved didn't understand at the time . . ."

Regardless of the Penny's sophisticated philosophy regarding the innovation and reality of what had been created, this was not something which was consolidated through management meetings, as he found it; "quite difficult to communicate because it is a different mindset." He was referring here to the mindset that is particular to different company functions;

> " . . . there is also a view I find in technical environments . . . I used to be a technical person . . . and now I think I'm more of marketing and service person . . . from a technical perspective things are not valued unless they took significant effort to achieve . . . and actually the things that are valuable may not be things that appeared to take significant effort and technical skill and pushing the technical boundaries . . . what an engineer says is 'I've done this really difficult thing and that's it' and actually from the point of view of the need the valuable thing may be the thing that was just thrown together in five minutes of spare time . . . actually the thing which was thrown together in the five minutes of spare time drew on all the accumulated experience, but because actually doing it, its often not valued by the people how do it . . ."

After Penny's arrival at Om he took stock of what there was in terms of technology, people and content. He compared this with perceptions of what was valuable according to his consultancy projects at Shell and the BBC. This served to guide his strategies of taking content and services forward and to develop them within Om and the trial.

However, there were distractions due to the handling and relating of what was a very dynamic technological phenomenon. As touched upon in the previous chapter, Om at this time, through its marketing and the PR had drawn an enormous amount of interest from a very heterogeneous blend of people and companies. Just simply managing this interest in some systematic way and 'surviving' day to day constituted major effort. It drew considerable resources simply managing the level of input and interest. This impact was by no means one-way. Marcus Penny would see that people would come to Om and leave with their minds 'profoundly changed'. Om had in effect, clearly created an extremely charismatic product, fuelled by their visions of what it could and would do. However, such a profile, cultivated and handled properly, would lay the conditions for the success of the project. This was certainly the view held at this time.

The content and services

Marcus Penny was optimistic that the development of the STB by mid-1995, and the Cambridge Trial, had unfolded in the best way possible:

> "I think the key to why I think that we're got something that's valuable here is putting the STB together, identifying what the need was, creating a demonstrator and lining the sights up to let it free run . . . and allowing the right creative inputs to flow, not to be dominated by any particular perspective . . . so something that's created that worked . . . the second thing was setting up the Cambridge Trial . . . I think there had been a lot of ambivalence concerning the Cambridge Trial and some understanding of why is it here and is it valuable . . . the Cambridge Trial was one of these things which was absolutely the right thing to do."

However, Penny came to be more than the product champion of content and services. When the climate within Om towards the Cambridge Trial (due to the business success of adapted boxes for Lightspan and Viewcall) – essentially splitting Om management into two camps – one pro-trial and the other anti-trial, he also found himself as champion of the Trial as an entity in itself. The main question regarding the Cambridge Trial was the expenditure of a major part of Om resources on a project which they could not envisage any immediate return from. Not only was this felt within Om, this had already been the rationality held by several of the technology partners for some time.

There had always been from the beginning of the project, some degree of imbalance in terms of the commitment of the members of the various consortium members – both in the service nursery and in CITVIC. Each had different levels of investment and motivation. This was reflected in scepticism from some quarters, and lack of drive in others. Om clearly had the most to gain from the success of the trial, but nevertheless had to invest the most time, money and resources to make it happen, and to drive it along.

Marcus Penny, however, argued that the two greatest assets that Om possessed with respect to a global industry perspective was the STB and the Cambridge Trial itself. He felt that these were unique and valuable elements, which together, differentiated the company from others in the market for STBs. Indeed his very existence within the project (as was the entire team who was involved with the trial's maintenance) was validated only by a sustained focus on content and services.

Throughout the period marked by adversary at Om towards the Cambridge trial it was defended by the Penny although at times he admitted to being somewhat isolated and "sort of friendless." However he continually argued a pragmatic line that crucial 'gaps' in the system, or in expertise, would only ever be realised through the experience of gleaned by conducting trials.[103] This is a distinctive problem when nobody has an individual prerogative ownership of the system. When it is a consortium and a group activity learning can only arise when individual companies execute their competencies and find (and can report to the other consortium members) that something is lacking. Developing STBs without complementary system components is rather like developing television sets without adherence, or knowing the specifications of broadcasting equipment. By Om asserting 'ownership' or at least responsibility for the trial it was in a unique opportunity to capitalise on the learning deriving from the entire implementation. He felt it was Om's strong interest to be sole owner of the trial and its vast potential for generating knowledge:

> "That meant that broadly no one was owning it and when I joined it became clear to me that there was a commitment to launch on Sept. 30th. . . the way things were going there was no way we were going to get there so I actually stepped in that point and did three or four things that needed to be done both by us and stimulating and pushing several of the partners to do things to make it happen. In that we've had to take on some things that in the initial scheme of things that were not to be what Om were supposed to be doing."

However, the 'learning by doing' aspect of the trial had clearly dragged Om into a number of different tasks which they did not see themselves to be responsible for. He stressed that the trial consortium was not a conventional organisation. He saw as a further task for those initiating such organisations was to create something of an understanding of learning how to work together:

> ". . . [these kinds of business relations] I think, are going to be a key part of this new industrial era we are entering . . . I think you have to learn how to do it and its based on the situation where no organisation can possibly do things alone . . . you've got to learn how to work with other organisations and

[103] Interesting to note here is how the pragmatic arguments for keeping the trial going were based on its ability to test the technical system. This contrasts with Marcus Penny's feelings that the trial served a much less tangible and symbolic role with the STB, such as distinguishing Om from other hardware manufacturers making STBs.

particularly work with an influence - people - over which you have no direct power . . . it proceeds by practical evolution because this situation is so complex that it is impossible to predict . . . you cannot gain enough inputs and hold them in the same mental picture . . . so you perceive by gaining some insights putting out some feelers, trying something getting the feedback, tuning it . . . and then out of that you discover things that work . . . and as you discover things that work you sort of look at them a bit more and you understand them a bit more about them, and then more consciously apply to that and elsewhere . . . It is a huge challenge to conventional corporate culture because it just collides with traditional bureaucracies . . . it is re-engineering, but the conventional approach to re-engineering is that you look at it, you analyse it, you stand outside of it, and you re-design, and then you impose a new design it doesn't work . . . as we used to say in PA phase 2 of re-engineering is the rubble . . . it is re-engineering but it is re-engineering by practical doing and exploration and testing a bit at a time . . . because you can't throw away the organisation . . . because that's he only thing you've got . . . you've got to evolve it . . . hence the concept that I think we're founding and we've been developing here about how to move forward with services . . . the idea of a service nursery."

If indeed, one of the problems was mapping out influences on the development, then perhaps here is the place where a framework, such as sociotechnical constituencies, could find value. It would certainly help as a 'cognitive tool' in helping to build the necessary metal picture of the complex of influences impacting development.

The Service Nursery

This brings us to what was perhaps the most entrepreneurial organisational innovation which arose from the trial: the ***service nursery***. The underlying concept of the service nursery was Marcus Penny's, although Dave Swallow originally coined the actual name. He picked it from within the discussions that he and Penny had engaged in with respect to the strategies that were being formed at the time to involve content and service providers. They felt that service nursery really did capture what they (the content and service providers) were doing consciously, with their learning process and the set of conditions that work.

The 'nursery's' prime objective was the provision of a 'safe' environment in which you can do the restructuring/ re-engineering reorientation necessary for expanding

existing business and business practices into digital media. They were now consciously selling the PSPs - Nat West and Tesco and so on - a notion that there was about to be a huge change in the way people sold and accessed goods and services. This was a time of course when it appeared that there was something of a competition between i-Tv-type services and Internet-based services to provide online access to goods.[104] This was going to impact, not only their business, but all business on many levels, and across many, if not all, industry sectors. The nursery presented a real opportunity to get a feel of what will be involved in this new world. Participants would have a head start on their competitors, developing new kinds of competency, and building early alliances with others who were ahead of the field. There was the suggestion that those who lagged behind in this revolution, would find joining at a later date would more costly, and more resource intensive. This is very reminiscent of the utopian forms of discourse discussed in Chapter 1.

One of the early service relationships was with ITN. Om received permission from ITN to use their material to demonstrate a news service. They also explored some ways in which they might work together longer term. Marcus Penny saw an opportunity to turn such relationships to one where Om could sell consultancy in new media development. ITN at this time were searching for digital alternatives through which to distribute its news content, and had already set up an on-line news link where people could download news to their computers. However the Om/ITN relationship was a mutual venture and did not generate revenue.

> "I don't think that was a surprise I think I'd expected and we'd expected to make business out of that and I think that still is . . . I think the new realisation from dealing with ITN for example was that an end result that was simply advice or knowledge was not sufficient that what was needed for the service nursery proposition was actually providing engagement . . . and participation."

[104] The first 'e-commerce' web site is cited as being Pizza Hut in 1994. In 1996 the US Government allowed the suffix ".com" to be released to the public domain for sale. This produced an exponential rise in commercial web sites.

Om was trying to sell ITN consultancy at a time when others, such as IBM were prepared to provide equipment and help for free. Om would have had some difficulty competing against that.

However, the real problem for Om was turning the vast amount of *interest* that the trial attracted into *actual* business relationships. There were a lot of people at the time who lay claim to some involvement in digital media, but in Marcus Penny's perception they were lacking knowledge on specifics of technology and strategy. He realised that if the objective is to sell STB's, servers and knowledge, Om would have to go into a business relationship where they would have to educate people - which represents genuine investment of time and money:

> ". . .[it was] rather hard work . . . I mean the service nursery actually when you look at it supplies quite a lot of needs its quite a complex set of needs . . . you need a trial as a reason to do it because until you've got actually something specific to work with . . . either a service you can offer through an existing delivery mechanism or something in which a group has been participating as an exercise which is consciously designed for trialing . . . its hard to turn an interest into an actual working partnership."

Penny had been wrestling with the issue of content and how to do it to build the business case for the trial. He realised that the only way of stimulating content provision was through engaging service providers which would be willing to pay for the opportunity to learn how to provide services in this new environment. Offering pure consultancy did not work due to the market was not sufficiently educated to understand the possibilities, pitfalls and potentials of i-Tv. They would not be prepared to pay money for 'pure advice'. The service nursery was Penny's direct response to early thoughts on how to entice paying service providers into the trial.

The service nursery has analogies with product and consumer tests with an actual working prototypes, all be it at a more systemic level. The more one gets towards a viable, working, fully configured system, the more reliable/viable/realistic - the results from any feedback one gets from partners, managers, trialists and so forth. The notion of the trial as a 'living environment' for testing and trialing services arose. The living environment alludes to the real world situation in which the technology

and content/services are consumed and used – what I have referred to a kind of experiential 'biosphere' (Nicoll, 1999). The intention is that it will provide naturalistic data above and beyond that which may be gathered by other methods (focus groups, market surveys etc.). This kept in adherence with the underlying principles of the service nursery concept as seen by Marcus Penny. Such a way of trialing technology and its market potential is also a kind of *grounded theory* (i.e Glasser and Strauss, 1967; Glasser, 1978) approach, but applied to technology dissemination. Issues, including user perceptions, feedback into a wider constituency of learning. It can suggest not only how a companies business may be 'impacted upon' or even 'impact' this 'new media age', but more immediately, how the business may be reinvented in the light of these sociotechnical changes:

> ". . . in this service perspective the idea that there such as thing as service, and it is an issue . . . because we're used to, we know what television is, we know what books are . . . the idea that you have to consciously think about and shape and direct the nature of the service rather than just supply content to it is a fairly new one . . . its a story that seems to touch a chord . . . because I think there are a lot of people out there who realise that the existing pattern of services that we're used to and have been established for and remain unchanged for decades are inevitably going to change . . . and what do you do about it . . . and I think what we're doing through participation in the service nursery is giving service providers some control over their destiny . . . in that they understand things about service provision which they probably didn't understand before because though they did them they weren't conscious . . . and they can then . . . they are also developing skills and working experience and so on the basis of that knowledge they can actually take their business forward . . . there are lots of people out there in the service industry across the whole sector whether its banks or retailers or entertainment . . . we used to providing this the whole ground is shaking under our feet and we can't do anything about it . . ."

This was perhaps an idealised vision of what the service nursery was capable of providing. There were of course many problems that were purely technology matters. Non-operational technology had primacy as a matter of concern over matters of content provision. For instance Om had been through this system learning experience the previous year [1994] when it realised there was a 'big hole' in the switching/ delivery mechanism, particularly the network switches - the 'squids' - which were a significant part of the system. This was something which, in theory ATM were

responsible for, however in practice it did not sufficiently fit their business interests for them to actually solve the problem, and this led to the inclusion of SJ research (switching experts) as a further member of CITVIC.

User Research

On the subject of user research, and in particular, the issue of on-line questionnaires etc., Marcus Penny was well aware of the potentials of the system to produce knowledge and learning. He was conversant with notions of how explicit and covert ways of realising what people are doing with the system had value. However, his preference was for inference from 'what they do' rather than 'asking them questions'. Of course this was something which was just becoming possible for the first time, and was an inherent aspect of digital system use. The sys-log data produced by the system would reap data illustrating which household, were using which service/programme, and what the interaction style was. It would detail how they respond to, and chose items presented on the screen. His opinion was that this approach would lead to 'real answers' (as opposed to questionnaire where people could 'lie').

This was recognised as a powerful feature and indeed, was the main enticement for the involvement of National Opinion Polls (NOP's) interest in exploring the potentials of the system. Marcus Penny claimed that Om will be working with them to make the correct inferences from the sys-log data, which needed considerable software development of the analytical tools. With this data Om, and the PSPs would then increasingly to tune the choices that they would present, working in an iterative fashion till the right inference is made.

Om and NOP would also provide questionnaires on screen for people to do, but Marcus Penny felt that there were stages beyond that which they wanted to get to. These stages were characterised by not providing questions, but rather providing experiences or experiential choices, and monitoring reactions. He viewed that there was a "whole new approach", an entire new way of market research, which surpasses

problems of interpretation inherent with questionnaire use, this included the incorporation of vignettes style programming where people would respond to alternatives.

But these visions of innovative market research were not yet realised in the real system. User-centred research/design is made more problematic when you have fully operating system with all its branches and avenues open. And this was more the status of the trial system at this time.[105]

Such a view bears strong relation with social shaping theories of innovation, opposed to more simplistic models of linear innovation, but rather recognising and bringing to the fore feedback loops happening at all stages of the innovation-diffusion continuum. Returning to the theme of order rising from chaos, he viewed that standards formation arises from such crises, 'if you believe in the approach natural standards emerge out of a dynamic process and are stable because the system keeps them in place'. He sees that crucial to the role of the 'new manager' (one that is in keeping with the new style of organisation) is essentially management of processes of crises and chaos:

> ". . . its something which you cannot plan and direct in the way that your used to it in a mechanical view of the world nevertheless there are structures and if you understand the behaviour particularly in the moving from stability to another . . . you can encourage that process . . . if you understand what lies behind that stability you can encourage or interact with it . . . but you've actually got to observe quite closely what's happening."

The services offered on the trial

The nature of services is something which is much more fixed as social phenomena than multimedia content is as a technical one. The system architecture and general underlying concept of interactive on-line services are, to a large extent, analogous to existing real world institutions and practices. To order goods through the i-Tv system relates to the already existing practice of using a credit card hotline, to order a video

[105] Indeed, as will be more fully illustrate in the next chapter, the trial *never* had all its menu branches and programming fully operational, nor did it properly *refresh* content to a level which would

on-line relates very much to going to the video shop, choosing and renting a video and so on.

There is clear relation from the user's point of view in the method of appropriating on-line goods and services and how they will appropriate goods and services in the real world. The way in which the goods are paid for, are called up from stock, and are finally delivered, mimic in an electronic fashion the processes and relationships which exist between the retail organisation, its bankers and its distribution networks. On-line services bear direct relation to their real world counterparts - they are virtual representations of real world practices.

Content, on the other hand is a much more ephemeral product or phenomena than services. Content relates to the style, interactive elements and aesthetic components of what is presented or represented on-screen. It may represent a company, product or service and essentially consists of variations in screen layout, buttons, graphics, video, etc. - essentially it is the interface between the user-consumer and the company or institution which is providing the service or selling a product. it has both functional and aesthetic properties, and as such requires a high level of creativity as well as innovation in its production.

The services offered on the trial (as June, 1995) included:

- **Video On Demand (VoD)**: including TV programmes, films, music videos, documentaries and features.
- **News Service**: national TV and radio news from BBC, local TV indexed news and weather from Anglia TV.
- **Audio On Demand**: BBC radio programmes including drama, comedy, sport, current affairs and education.
- **Home Shopping**: well-known high street names, including Tesco and The Post Office.
- **Home Banking**: NatWest customers can access their bank accounts and perform transactions.
- **Education**: interactive learning programmes from Open University, BBC, Sherston and Anglia Multimedia.

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stimulate trialists to regularly access and use the system.

- **Information**: leisure information, superfast teletext service, World Wide Web access. Consumer Research: online questionnaires and other forms of direct user feedback and involvement.
- **Programming**: interactive guide with timings to broadcast TV programmes.

Marcus Penny believed that they understood the essential differences between content and services "more clearly than anyone else in the world." His solution to the content problem was to stimulate the creation of services. From previous interactions with service providers there was the belief that they would understand the services perspective sufficiently (opposed to not understanding the technical perspective) that they would latch on to that and be persuaded to invest both time and money.

Making the Trial Autonomous

As previously mentioned, some quarters within Om viewed that The Cambridge trial had served its purpose in highlighting Acorn's role within the emerging TV-centric information market. In many respects it had served a similar purpose as the 'concept car', or a conceptual architectural plan. It served as a showcase to the world but now it was a drain on valuable development resources. There were now those who felt that the Cambridge Trial, and the orientation of Om should remain true to the Om mission statement - that of creating and developing consumer orientated network technologies, but were not convinced of the network infrastructure which would deliver this. They felt pragmatic and responsive to the real business opportunities that it had brought, and recognised that valuable development resource should now be concentrated on non-cable/ATM applications.[106]

However, there were those who, along with Marcus Penny, remained convinced that there was more mileage in the cable/ATM infrastructure, and who wished to follow a more content orientated approach to financing development. Further, there were also those who were looking ahead and could see that terrestrial digital television was a

[106] Making the generic STB suitable for specific purposes, whether for CD-ROM use or for modem use, presented their own unique development problems. These required time and resources which had to be redirected from trial development.

further opportunity on the horizon, and felt that development effort should pre-empt this. On top of these problems of a more strategic nature, were more immediate problems within the trial itself, most of which centred on the provision of content.

However, at this time the trial was basically content starved – the trialists were simply not using, as there was nothing to use. There was a desperate lack of content, as well as a lack of turning over (i.e. updating) what little there was available. While this was due largely to copyright problems, it could also be attributed to content development problems. Om orientated itself to be a STB manufacturer, after all Acorn's competencies were considered first and foremost in the field of computer hardware development. However it was known early on that it was essential to generate content for no other reason bar the fact that the STB was a ***medium.*** In order for the users to operate it and to showcase the technology at trade shows it had to carry attractive content material. Users or potential clients could hardly judge the box on its own merits or produce any sort of meaningful feedback unless it carried content.

The accumulation of content problems, and the pressures within the company to kill the project, resulted in those responsible for the Trial team developing their own business plan. What emerged was a strategy that had been embryonic for some time and whose underlying assumption was that [potential] content and service providers would pay to 'learn by doing' or rather, 'learn by participation'. The trial would become the learning environment of the service nursery. Economically, the Cambridge Trial was to become financially autonomous, the 'children' paying an entry fee which would keep it afloat, financing the system's development and architectures. In practice the service nursery comprised of a number of working groups and management boards (see below).

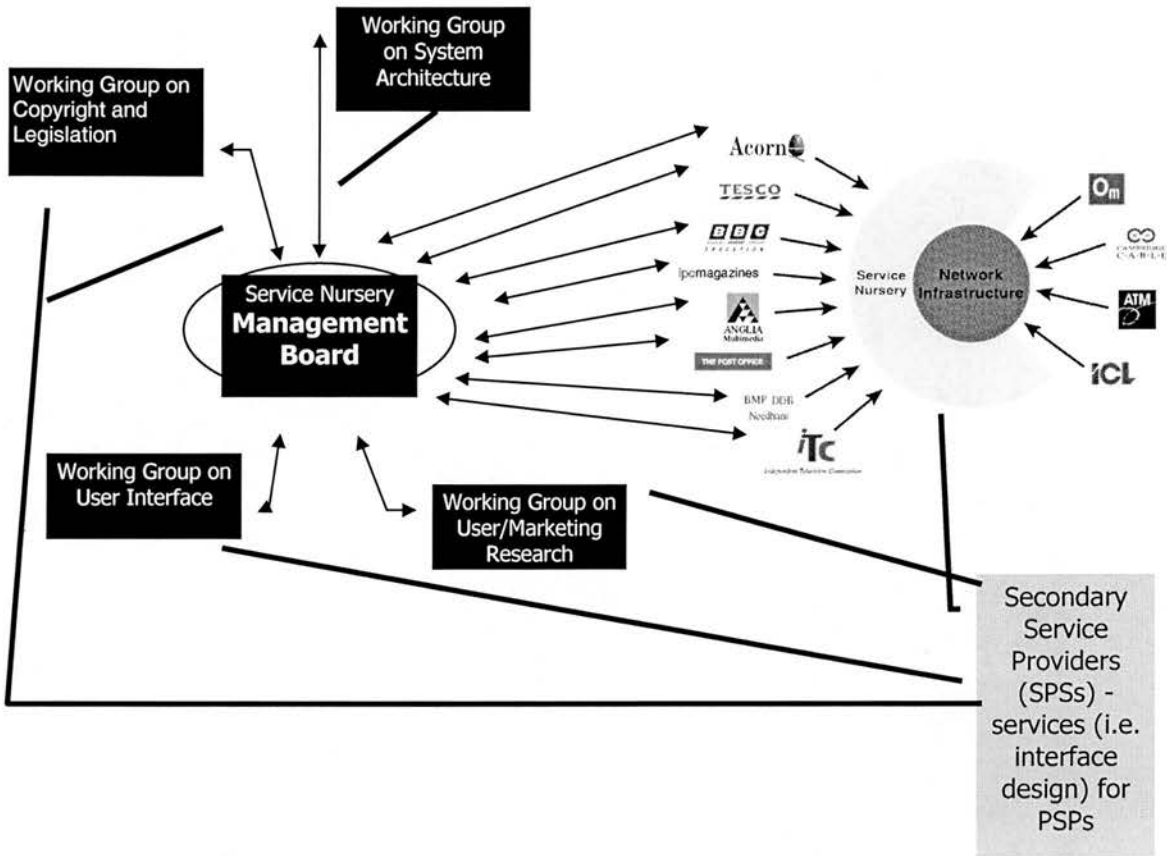

Fig. 6.2 The service nursery: The PSPs are on the outer ring, with the Management board central surrounded by the working groups

My main purpose for being involved with the trial was to conduct usability studies and more general user research. As such I was invited to follow developments in the user research/marketing group. This group would be responsible for:

> ". . . looking at the plan for sending questionnaires and conducting user interviews . . . The intention would be for this working group to define a number of questionnaires and points at which users are contacted and to ensure that this is coordinated so as not to overload them with too many interviews and questionnaires." (Cambridge Trial project manager)

The working groups were to be facilitated and chaired by Om, and each would comprise of those staff of the PSPs, who had an interest in or whose jobs were concerned with market and consumer research. Also a number of secondary service providers (SSPs) would act to provide PSPs with necessary expertise or skills that they may be lacking – multimedia authoring, data- and image libraries etc.

Chapter discussion

What I have tried to outline in this chapter is the organisational elements that shaped the trial, and led to the development of the Service Nursery in the Cambridge trial - a trial which stands as testament to the complexities of technical and social management in the new media age. To a large extent I have concentrated on the individual view of Marcus Penny, the 'constituency builder' and champion for the development of content and services, and who developed the concept of the services nursery.

The promise of a trial means that new cutting-edge technologies are to be tried out *en situ* - the naturalised settings of their intended physical, social and cognitive locations. For that to happen it is clear that as much as possible the technology must maintain a high degree of projected use characteristics if user-consumers are to be employed as generating useful and meaningful data. Perhaps it is the same problems as Donald Norman identified at Apple in respect to effecting HCI strategies in product design: "10% of the problem involves the science and engineering knowledge of HCI, 90% reflects the social and managerial side. The real problem is one of attitude, which then gets reflected into organisational practice." [107]

Also, Erlandson *et al* (1993: p.16) see that naturalistic modes of inquiry are very much dependent upon context, they are "bound together by a complex web of unique interrelationships that results in the mutual simultaneous shaping [process]." Such processes represent well the constituency building processes in trials. The results of the trial, the learnings arising from the trial, were understood (at least by Om) to be fundamentally explorative and experimental types of process:

> "The original partners knew that they could only predict a certain proportion of the outcomes of their involvement. But all knew that they were committing to an experiment and as such nobody could state with 100% confidence what the results would be." (Om promotional literature)

[107] Donald Norman 'Where HCI Design Fails: The hard problems are social and political, not technical' BAYCHI February, 1993.

However, any notion of the users being important 'co-researchers' or 'joint explorers' of the potential of this technology were lost under the weight and complexity, the shear attention demand of the organisational elements. It is clear from the discussion with Marcus Penny that although he championed the services and content aspect of the project, there seemed a kind of engineering/ technical feel and logic applied to the social construction of the service nursery. It was a very much 'suck it and see' mentality which is more commonly associated with a more scientific or engineering type of problem solving and logic.

Lust of result, desperation to get value for investment, coming to grips with the contrivances and the unique problems of conducting trial research in the new media age, as well as lack of real investment in trial organisation could all be cited as reasons for why their was no right management of the user research project.

Understanding of these problems has motivated recent work at Edinburgh (Molina and Nicoll, 1996). Contexts of use, particularly the demo STB's ability to represent and symbolise the potentials of the system, convinced not only members of the Acorn board that this was a good idea worth funding, but inspired members of the design team itself. Marcus Penny had his visions of the domestic networked future legitimised by the symbolic prowess of the demo box. Many others, at trade shows or visits to Om's premises were also charmed by what it projected. The demo box as symbol, represented a considerable constituency-building force.

Trials in this sense are distinctive constituency building processes which shape the way technology develops, how users are enrolled and what is expected from them, as well as how technology and financial partners are found and eventually impact development. Given the problems that may arise in the management and evaluation of trials, such an approach may function pragmatically as a generalised approach for the conductance of user research programmes (scaled towards the given circumstance) and aiding product and service development. Alternatively, it may

guide trials, integrating user research as part of the more generalised and macro level strategies and within wider and more external shaping forces.

From simply ensuring that specifications were competitive with other products, the Cambridge Trial came under an increasingly complex array of forces which shaped the technology as well the way in which the trial was managed. While this was mainly due to the needs generated by potential and actual clients, it also included feedback from trade shows and demonstrations of the technology from potential clients. There was also informal feedback from the wide media coverage which the trial had drawn. These created an ever-increasing set of demands both upon the technical specifications of the system, as well as the management contingencies which administered the trial. The stakeholding theories of the service nursery concept, which was designed to make the Cambridge Trial economically autonomous from Om eventually produced a number tensions impacting the governance of the trial, as well as specific development activities including implementing the user research (more fully illustrated in the next chapter).

The Cambridge Trial was an ambitious project fuelled by a number of different influences. The suggestion was that it was staged as a condition for funding money from the city. However, it came to be widely understood as a PR opportunity, as well as a way by which Om could profile itself as dipping the water into the realm of the suspected consumer market for i-Tv. As a result of the continuing development and evaluation of the technologies involved and the learnings arising from the development of the services, new opportunities arose for sales totally independent of the trial. It gave Acorn credibility in the arena for advanced media products intended for the consumer market. Some of their more recent developments come on the back of technological development and business synergies which came about as a result of conducting the Cambridge Trial.

The fact that the Cambridge i-Tv Trial continued to be a test-bed for new and developing technologies meant that the participants (both technology and service) were collectively able to lay claim to a number of 'world firsts'. This was supposedly

in terms of the technological achievements and the services that had been successfully developed, delivered and evaluated over its infrastructure. However, it was not all roses, there was vast gaps in the social and technical constituencies which opened as the trial and the service nursery progressed. This was far from the claim that as new technology was developed: "the Trial moved closer to its original and central objective: the full testing and evaluation of the technical and commercial viability of supplying interactive services across the information superhighway directly into homes, schools and businesses."

One of the most major problems that had serious implications for content development, was Om's decision to use a proprietary software system to create content and pages. Terry York - Interface Designer felt that this was a hangover from that part of Acorn culture which had a predilection for individuality and differentiating itself from other companies[108]. However, this meant investment from companies which expressed an interest and intention to create content - i.e. the PSPs - both in terms of appropriating a Risc PC, and the necessary training in order to operate the system and accompanying software. It was mainly due to this that BMP DBB Needham's test advertisement for *Walker's Crisps*, created by *Macromedia Director* software (an industry-wide *de facto* multimedia authorware) was unable to be broadcast through the system.[109]

The eventual product, more identifiable as a domestic NC, provided an inferior access to the internet than a PC/modem set up. Moreover, it did not meet the vision which was sold to trial participants some time before - that of full blown video-on-demand, home shopping and banking (as will be illustrated in chapter 10 which addresses the user impressions of the trial). The Cambridge i-Tv Trial was

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[108] It was felt that it was only in recent years that they have tried things to make technology and software more industry standard. The RISC PC, for instance is the first Acorn machine to have a standard PC keyboard. This had immediate benefits in terms of cutting manufacturing and production costs. At the time of Om's development of the STB, Acorn were only just in the process to support JPEGs as standard in the OS. There was a cultural reaction to this at Om which stated that everything they created would be industry standard, they were not going to do anything which was proprietary as it was realised it would cause problems.

[109] Om and Olivetti in fact signed a joint development and marketing agreement with Macromedia in Jan 1995. However, in mid-1995 they still had standards problems for the production of services.

nevertheless an example of vision which viewed:

> " . . . a partnership not only between the companies who jointly run and administer the operational side, but between them and the companies who have decided to develop services to run over the Cambridge network, and more importantly between the service companies themselves. By pooling their resources, working methods and knowledge, this powerful union generates many benefits. Equally important are the Trial's users, whose active co-operation is a vital resource for research and feedback." (Om promotional material)

In the light of my own experiences (which are more fully explored in the next chapter) within the social mechanism of the service nursery, such a view strikes me as utopian, and perhaps overly optimistic. The service nursery was a concept which relied on the development of self-organising groups, which would somehow gel out of their intrinsic interest in learning.

While some aspects of the larger constituency may have reaped benefits, some of the working groups obviously failed in their missions to deliver material, research, or content. Many of the service nursery's constituents were never represented on the trial. Those that were, only offered dramatically reduced or demonstration services, which provided little to feedback upon. Also recruitment to the various phases of the trial was severely plagued with poor response. When the trial went 'public' in phase two, the target number was never met, nor was the blend of participants what one could call a 'representative sample, nor even for some service nursery members a 'relative' sample[110].

Conclusion

This chapter has demonstrated:

- That technology trial of new media are indeed prime examples of sociotechnical constituencies - they comprise of complex and sophisticated system technological elements (state-of-the-art network, video and storage technologies), and equally sophisticated social and business elements which included a strong emphasis on the selling of visions made carnate (i.e. demos), alliance building (converging under a promise of continual learning, shared interests and concurrent

[110] I refer in this case, particularly to Nat West. They had very few customers within the trialists.

development), agility (i.e. fast response to client needs and market opportunities), and development of business practice (constantly evolving strategies and orientations).

- The tension (and need for symbiosis) which exists in the development of media technologies and media content. Viewed as a system technology, content is a major component (as for Edison it was electricity, for Bell it was business subscribers and for Baird and the BBC it was programmes and schedules).

- How Om were forced to consider the content and services position almost from the start of the project, and something of how this was viewed as foreign to their business, driving the trial to become financially autonomous, and largely creating the need for the service nursery concept. Also, another major factor driving the need for autonomous content provision was the circular problem of getting media companies to commit content for a trial - primarily due to economies of scale (i.e. it is not economically viable to release a brand new film to 100 people), and how this drives the need for partnerships.

- The sort of relationships which are happening within the sector - i.e. an unpacking of the so-called converging alliances of service and content providers. Institutions tend to have varying motivations and run under their own inertia.

- The impact of the trial and the concept of the technology as a catalyst for innovations, and how these were recognised and viewed as part of a value-added package for potential and actual partners. Others parts included access to user data and an opportunity to 'learn by participation' (i.e. Om supplies the technology, PSPs learn how to exploit it, as well as develop the ways of working together).

- How the new media sector in some cases leads, and in others acts as a prime example of how the nature of business is changing.

The partnership of Acorn with Oracle to produce network computers (NCs).

> "The original partners knew that they could only predict a certain proportion of the outcomes of their involvement. But all knew that they were committing to an experiment and as such nobody could state with 100% confidence what the results would be."[111]

The Cambridge i-Tv Trial evolved beyond the rather open-ended initial objectives set by the partners. Indeed its success was claimed as largely the fact that the partners developed their own objectives and aspirations alongside the common goals of the [technology] infrastructure consortium. It was suggested that all were committed to a

[111] Om web site.

long term strategic future in this market. Much has been written about interactive TV in the meantime, and everyone would agree that much has been learned. What was realised was that the interactive TV 'big bang' was in fact still some way off - though everyone left the trial 'more positive than ever that it is going to happen' (Om promotional material).

Chapter 7 – Access

"If every product is really a service, then every contact or communication with customers is also the product." (Kantor, 1992: p.10)

"The world is not what I think but what I live through." (Merleu-Ponty, 1962: p.xvii)

No man's knowledge can go beyond his experience. - John Locke

Introduction

Earlier in chapter 4, I outlined that the 1990s witnessed the adoption of ethnographic styles of research over a number of distinct fields and disciplines. I have also indicated that the present study moved from one which was had a preoccupation with users (i.e. their perceptions of the system) to one which focussed more upon the organisational situating of the consumer-user research projects within consortium organisations. Any attempt to perform worthwhile user research and evaluation of the system relies upon the availability of a robust delivery mechanism, as well as a constantly refreshed substantial series of enticing content material. The prototype must be a good working representation of what it is that will be sold in the public domain. If it is not, as was the case with either the Om stand-alone demonstration STB, or with the Cambridge trial itself, the relevance and veracity of any user feedback is limited. For instance, the system's nearest comparison in user's mind was of course broadcast television, video recorders and video games. Broadcast television is the epitome of refresh – it provides a constant stream of new material. Lack of refresh is akin to having a library which is only ever stocked with a few books, themselves attractive to only a select band of people, and with many of the pages missing. This was similar to the performance of the Cambridge system. Due to weaknesses in the systems performance and a lack of content the trialists simply lost interest in using the system.

The reason for this predicament I cited earlier as arising chiefly form the complexities of governance and organisation. This chapter aims to illustrate something of this complexity from a first hand account of my experience of 'getting involved' with the Cambridge trial. If one's focus, as it within the present research, is upon the notion of collapsing 'cultures of production' and 'cultures of use', it remains equally relevant if one studies this phenomenon from *either* the organisational or user perspectives. This was indeed the case here where *both* perspectives were sampled and considered. But it came to be realised at the analysis stage of the research that the process of *constructing* and *approaching* the user research form the organisational perspective provided a much richer, and I feel, more pertinent and relevant account,

of the process from both an academic and an industry perspective. It was according to McMaster's (1997) account of chaos theory: "the area of most information."

Minimising the constraints of preconceptions

A challenge in ethnographic research, following phenomenological approaches, is to either minimise the constraints of preconceptions, or at least to acknowledge one's preconceptions so that one allows another's experience to be communicated in a relatively undistorted fashion. This is the stance of social sciences, and in particular interpretist social science wishing to become recognised as rigorous. Moores (1993) draws attention to the notion of reflexivity (or lack of it) in ethnography, citing the work of James Clifford (1986):

> "Clifford talks of the necessity for a 'specification of discourses' in ethnography. Anthropologists should be willing, he says, to specify who is writing, about whom, from what relative position, and in what material circumstances." (Moores, 1993: p.64)

Moores (p.65) also notes that: "As a stranger in the living room, his [Morley's] presence would surely have been a significant factor in how the conversations were organized and what people were prepared to tell him."[112] Hence, putting a study in any kind of theoretical framework best be postponed until after the researcher has reflected on his or her own guiding assumptions and metaphors, in order to: a) obtain better insight in what he or she is bringing to the research setting and participants, and b) to obtain an understanding of how that would influence the research experience itself.

As previously explained the original intention in this study was to conduct usability testing of Om's trial technology. The results of which would serve to feed back to the

[112] An example of how 'unnaturlistic' it can be to have a researcher in the private space of the home is graphically depicted by Walkerdine (1990) in her strongly self-reflexive, ethnography. Interviewing teenagers at home she was announced by one girl's father by: "Joanne, here's your psychiatrist!" This highlights something of the preconceptions people have of being interviewed and researched, and how this can produce a particular mind set which may interfere with the aims of the research. Another example is given by Ellen Sietier, (in Seiter *et al.*, 1989) who expressed considerable frustrations when things did not go her way when conducting an interview.

company with relevant data that could be used in their product development process. This would also serve as a basis for this thesis, and the 'grounding' for the theoretical aspect of contextual usability. The intention was to explore the symmetry or asymmetry between design and use, production and consumption. It was envisaged that I would track the development of the product and its CAFFs, and explore how they would be interpreted [or re-interpreted] by consumer-users.

This original intention was largely based largely on good faith in press reports, early communications with the firm, and my own pre-conceptions of the issues which would arise as the trial unfolded. As time progressed the original intention was thwarted by a series of obstacles, mainly due initially to hitches in the roll out of the first and second phases of the trial (and commercial sensitivities regarding this).

Marcus Penny, Om's senior manager in charge of services felt that there was a "very important public interest perceptive from a very fundamental aspect . . . if [i-Tv] is not seen to be broadly in the public interest we won't be allowed to do it." This perhaps hinted at the way in which my study was perceived. However as the social relations between outside agencies and the Cambridge Trial became more complex, so my role came under new pressures, partly due to politics within the service nursery working group on user research. As will be illustrated by this 'process' chapter, my position as a researcher, as well as the research itself, was compromised due to the real-time, real-life and 'chaotic' dynamics of a highly-pressurised technology and marketing development process.

The Cambridge Trial bred a complex development environment where casual and unexpected interactions with outside agencies appeared to create quite radical changes in strategy and orientation. Conditional access to the trialists became a matter of further negotiation as the trial evolved. Nevertheless, the research, which was conducted over a period of years, developed an interesting secondary frame of analysis - logging my movements or my 'navigation' towards an ultimate goal of conducting the user research.

This 'navigation' presented unique insights into the governance and social structures of the trial, and, as a product of opportunity, guided, along with the theoretical contributions of sociotechnical constituencies and contextual usability, the ethnography. This was a study which could not of been contrived. It could not have arisen given the normal course of research funding and implementation, since it could not have been planned.

I have already drawn attention to the macro-level influences, standards, protocols, public feeling etc. in which the trial, as a social and cultural phenomena, was situated. Both theories - sociotechnical constituencies and contextual usability - sensitised my awareness of contextual and environmental issues regarding where the project was going and why. They influenced the types and kinds of questions asked. For instance, many individual aspects of the trial constantly evolved, and evolved concurrently. One of the few constants that held up over the trial seemed to be the perceptions of the users - whether they were consortium members or general public - they remained largely unimpressed by the system's actual performance. However, uncovering their true feelings and understandings regarding the technology and content, always appeared low in priority in Om's agenda. This was most notably against the background of PR and publicity opportunities that the trial presented.

In the first chapter, I have drawn attention to the way in which 'visions' can mix with truths and non-truths in terms of actual or real development. Sometimes this can go as far as firms reflexively 'taking in their own propaganda.' This questions the veracity (or even choice) of academic research on commercially sensitive subjects. Many studies of firms and technology development report as if total access were a given. Very few discuss at length the difficulties experienced regarding access or poor reporting of actual events by company personnel. One of the problems of relying on what 'one is told', is that the real dynamics of the processes remain unknown, and one simply cannot, in the early stages, develop contingencies for pre-

empting questions or even proper approaches[113]. It is only through involvement at some depth, using 'lived' 'action' or ethnographic style of approaches that real processes may be understood. It was in such a style that this research was conducted.

There was an explicit social construction of the user research within the service nursery. A working group was dedicated solely to its development. However, Om relegated most matters of governance and management to the group itself. If indeed the service nursery were to be a learning environment, it is difficult to imagine it becoming simultaneously autonomous in its governance. The relations between the working groups and the management board seemed unclear, as to my knowledge no minutes were ever taken in the user-research group. Expanding on its own metaphor, it is akin to having a crèche run by its children. As Marcus Penny had it the service nursery existed; ". . . because there is a common interest that it should exist." As this chapter will explore such a 'common interest' was challenged by the lack of a clear approach to how the user research should be conducted. Some commonality of vision had been reached in the technology. The technical needs of the system- i.e. getting the system components to work in concert - were problems of a reasonably tangible nature. Engineers have the common vocabulary of specifications, requirements and standards through which they can communicate and reach consensus - within and across companies. However, the user research and, as detailed in the previous chapters, other matters such as the development of content, were perpetually hindered and confused through technical, organisational or recruitment complexities.

This chapter includes original e-mail material, and although I have anonomised the various people involved, where e-mails are cited matters of spelling and format remain as in the original document.

First contact

On the 3rd July 1994 an article appeared in the *Sunday Times* 'Innovation and

[113] This, of course, is not a situation which is peculiar to company research and commercially sensitive subjects. Any self-report, particularity that which relies on memory of events is open to distortion due to re-interpretations, and other influences such as social acceptability.

Technology' page. The headline read "Acorn grows interactive TV".[114] I approached a colleague who had been carrying out research on Acorn and was provided with a contact name and number. First contact with Om was made in early August 1994, about a month before the publicised launch of the trial. A positive reply came from Om, via Gary Nelson who was the technical project manager at Om, and who was to serve as my linksperson with the company. He expressed interest and asked for a proposal. In this, I detailed two intentions. The first was to conduct user research on participants on the trial - to ascertain something of their interpretations of the technology. I would also test the system for usability.

I had already became aware through literature review that usability testing as a practice was expanding its horizons to encompass a wider set of prerogatives regarding the relationship of the user to the act of using (as detailed in chapter 3). I had already done some thinking on interpolating this expanded notion of usability with work drawn from cultural and media studies. Contexts of use were deemed particularly important in cases of use of domestic media (Silverstone, Morley and Hirsch, 1992). I had also become aware that producers of new media products were apparently at a loss in methods predicting the success and failure of their products[115]. I had a basic working concept of CU at this stage and sent an initial proposal to the Gary Nelson on the 19th of August 1994 (two days after initial contact).

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[114] "Acorn grows interactive TV" Innovation and technology *The Sunday Times* 3rd July, 1994 p3/10 An advert for a Pentium 60mhz appeared on the same page. This serves as an index to what the state of PC development was at the time, and what was on the market.

[115] For instance, Scott McDonald, Director of Research at Time Warner Entertainment, discussed the impact of the merging of computers with communications channels and information and entertainment providers. In a talk at CHI '95 entitled *'Learning from Diversity: Interactive TV, Computers and the Frontiers of the Cognitive Sciences,'* he spoke of how the knowledge of computer human interaction derived from conventional computer systems and their users is not necessarily applicable to the new, larger combinations of computers, communications and entertainment. He sees users of new systems, such as i-Tv, having a considerably different 'mindset' from traditional computer users. He sees that the very broad choice of material available will have to be presented in new ways to them. Also, Logan (1994) points to the fact that consumer- and entertainment- oriented products (including i-Tv) demand an expanded definition of usability, while recognising the fact that this expanded definition is 'in-the making':

> "At TCE [Thomson Consumer Electronics] we are committed to going beyond [traditional usability], although what beyond is, is not completely clear." (p.61)

However, it appeared that there was little time in which to prepare my research plan as the official launch at this time was ten days off. I had a concern to implement a research programme *before* trial participants had been exposed to the system and its capabilities. Keeping in line with the spirit of evaluation research the original proposal had two main thrusts:

- A study of the forces shaping the innovation process itself, from the company perspective.
- A series of quantitative and qualitative interviews with trial participants.

My initial request was to interview Gary Nelson in order to set some context for the project, and then conduct a preliminary guided interview with participants before the installation of the sets. This was to be subsequently followed up with semi-structured interviews after two to three weeks (locating initial impressions and problems in use), and a final interview at the end of the trial, or after six months (after the technology 'domesticates').

I included a draft transcript of the sort of questionnaire that I had developed, which was based on existing media use and consumption as well as usage patterns, and I envisaged that this would provide initial data through which to base comparisons on subsequent follow-up interviews. I welcomed feedback or questions concerning the structure of the proposed project in general, or the questionnaire in particular. I also suggested that he kept me informed of any additions or points of stress that he or the company would consider of value for their own purposes.

The Gary Nelson replied the following day with a confirmation that he had received the questionnaire and proposal, and had received the OK from Dave Swallow of Online Media on the project, providing it did not cost them too much in time. He was to go on holiday from the 26th of August till the 2nd of September, when he would provide feedback on the questionnaire schedule. I would use the time remaining to the launch to conduct some pilot testing of questionnaire schedules. It was also clear that the limited time meant that any preliminary study would have to be on a small and manageable sample (<10).

Second contact

My next contact with Om was on the 6th of September, to prompt some arrangement for me to visit their HQ, to which I received a reply on the 9th, stating that the Gary Nelson would be happy for me to visit. They had chosen the phase 1 subscribers, and he asked if it would be a good idea to start the initial interviews with these. They were still targeting the end of September to begin the trial, but it was 'looking tight'. They were also in the process of initiating an education 'sub-project' to the trial, with the intention in phase 2 (planned for early '95) of including a number of local primary & secondary schools.

During this time I had pilot tested my questionnaire, and was now developing a feel for how people generally conceived of television and media technologies. I was experimenting with a number of different approaches regarding questionnaire implementation - whether it was more effective presented verbally; whether it was better presented to each household member individually, at different times; whether it was important to note any transactions between members etc. The pilot sample of 15 households were recruited through informal networks. They came from a wide range of backgrounds and demographics. This was purposeful, as I (erroneously) assumed that the trial participants were to be an eclectic blend of average television consumers, and wished to emulate something of this in the pilot study. I also passed the questionnaire round a number of the academic staff at Edinburgh in order to elicit further advice and feedback.

Outcome of pilots

The pilot study and feedback from academic staff drove several iterations on the questionnaire content (both structure and individual items). A number of points emerged regarding elicitation of people's knowledge of everyday activities. What some respondents had answered in the questionnaire, contradicted information which came out in the informal chat which followed the questionnaire answering. This

prompted me to ask for their reflections on the questionnaire process itself. There seemed that there was some consensus among respondents regarding the artificiality of the process - sitting filling in a relatively large questionnaire survey, while I sat observing, and other activities (such as kids playing) interrupted the otherwise silent period of completion. Further, some respondents had extremely strong points of view regarding the use of television, and others (a BBC television producer) had apparent knowledge of the area of i-Tv. He was antagonistic towards any claims regarding the implementation of a trial. In most of these occasions the discursive aspect of the research - talking - was very rich.

I noted a tendency in those interviewed to offer contradictory accounts of their media practices. In one case a mother of a young child was adamant that she did not allow excessive viewing of the television, preferring instead to do 'constructive' activities with her young daughter. Later in the conversation she related occurrences in her everyday life to events in various soap operas, and remarked on her daughter's references to various television commercials. These were quite obvious instances of where self-report was influenced by social acceptability. In this case, feeling that viewing television was somehow detrimental to an image of a family or parent who pursues 'more' constructive, learning activities during their leisure time. In many of the more affluent 'middle class' households which were interviewed it was felt that television viewing was a 'wasteful' experience, absorbing time which could be spent on more creative or healthy activities.

In those families which completed the questionnaire it was further noticed that for some questions it seemed natural for people to seek clarification or reinforcement regarding answering. In particular questions concerning amounts, quantities and locations of media technologies prompted discussion or affirmation, as well as, questions addressing each other's consumption or use behaviour.

The result of the pilot session brought about several initial questions:

The process

I became uncertain that a questionnaire survey was the best way in which to proceed with asserting current media use and consumption patterns. Remote administration of the questionnaires also seemed a problem as people may compare and adjust answers.

The objective and outcome

What was the veracity of the answers drawn from the questionnaire? There seemed a problem as different household members offered different explanations when discussing the same phenomena.

The best way to approach

By appearing in person so much more can be learned regarding participant's life and lifestyle, as well as their outlook and what is important for them. Remote administration relied too much on the research instrument.

It was obvious, with limited real knowledge of the trial at this stage, that there would have to be a 'learning by doing' aspect to the research. My feeling at the time however was to minimise the possibility of contamination - i.e. I wished to approach trial participants before they were exposed to either the technology or any paraphernalia/media exposure that would help create preconceptions regarding the capabilities and potentialities of the system. My attitude was one of learning the finer points of the technological functionality of the system, as well as developing knowledge of how they had selected their phase 1 participants:

"Obviously, it is crucial to the investigation to have some [objective?] idea of the transactions that have occurred between yourselves and the households, which may 'colour' expectations about the qualities and operational parameters of the technology. When precisely the trial actually begins is no problem from this side of the fence (more time the better!), apart from the point of 'colouring' (i.e., if there is a massive pro or anti-interactive campaign by the media, viewed, of course, by participants)" e-mail to Om Fri. Sep 09 1994

My attitude therefore was experimental in style, with the people's existing lifestyles, media use and consumption as an 'independent variable'; the i-Tv technology was viewed as a 'dependent variable'. Confounding variables to look out for would be extraneous influences to the participants' perceptions or anticipations of the technology (such as press reports, the comments of the installation engineer etc.)

At this time I was also considering the logistics of the project. I was of the opinion that the first phase of my project should involve the administration of my questionnaire schedule at a time which would be convenient for the participants (those aged 16+). Two things seemed to be involved in performing this; one; making sure that there was a convenient time to come round for an hour or so, and two; being able to do two households a night (the presumption being that that was the best time to catch people at home). I was further interested in the characteristics of trial participants in terms of demographics, socio-economics etc. I wished to make a preliminary arrangement to go to Cambridge on the 21st Sept., and staying till about Oct. 1st. or 2nd. (leaving enough time to interview the families).

Three days later, I made a further request for some indication of trial participants, in particular what was important (above and beyond demographic information) was household composition. This would effect the logistics of the research. Also important in this respect was their location in proximity to the centre of Cambridge, and within themselves. With respect to this I requested any maps which would show participant distribution. I further requested details of the selection procedure (i.e. what they had been told about the product and the questioning procedures). I was also interested in what the procedure would be regarding the deployment of the systems (i.e. by an engineer, who will show them what to do etc.).

Lastly, I enquired regarding the perceived date and time that the units will be distributed. As it is the battery of questions will take up to an hour and half. This may take some logistical working-out concerning the arrangement of a suitable time when all adult family members may be present. I would like to take them through the questionnaire together. The making of appointments to do this would be the best idea. Could Om handle this, or should it be done from Edinburgh? Also at this time, I was thinking of video-taping the arrival, and initial explorations of the family with the unit. Could this be negotiated with the installer and those households concerned?

Breakdown of initial assumptions

On receiving the responses to the recruitment form one of my main initial assumptions were up-turned. This was the discovery that participants on the trial were not 'average' consumers - i.e. anything like a random sample of people drawn from the population of Cambridge. Most were employees of the Om, and indeed the technical designers of the system. This constituted a crisis regarding the planned research procedure. It showed me that I had developed considerable pre-conceptions of the trial, and rather rigid in my approach. The designed approach was designed with 'naive' users in mind - i.e. persons with little or no exposure to the features and functionalities of the system.[116] The group that was picked was indeed far from naive. Indeed, they were extremely familiar with the product. This sample would also exhibit other relevant influences which would distinctly bear on evaluations and interpretations of the system.[117]

Phase 1, even though recruiting from the Om 'ranks', only ever managed to recruit eight trial participants. I sent out a request to those households that were on e-mail. Replies were not immediately forthcoming. I was going to Cambridge the following week to conduct my initial interview with Gary Nelson who was the Project Manager of the Cambridge Trial. It was becoming clear that there had been considerable technical problems involved in implementing their trial. Not all the homes were connected. The launch of the trial did not entail anything like the simultaneous connection and transmission of interactive services to 10 houses. The 8 homes that eventually comprised Phase 1, would be connected over a period of several months.

This extended roll-out of the trial was a further blow to the rigidity of my approach. I conducted the in-company interview but had to leave Cambridge without

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[116] Much of the inspiration of the original line of thinking came from usability engineering, which stressed stringency on recruiting representative samples of users (for instance Dumas and Redish, 1994).

[117] For instance, being computer enthusiasts. This manifested in the language used in the form where one respondent watched, "no" - described "zero" - television a week. He spent his entire spare time

approaching any of the trial participants. However, I understood fully at this time that the protracted roll-out was due to technical problems of the system. Phase 1 was always intended to be predominately a technical trial - i.e. a trial to basically check the system's potential to transmit anything at all. It was pointless at this stage, from Om's perspective, to explore things such as participants' existing media habits. Or tracking these against preconceptions of the system and the way in which the technology was deployed etc. This phase did illustrate something in the way trails are structured. This was the genesis of the study adopting a wider perspective towards the trial, as a study of process than simply the technology and users. These developments also suggested something of a dichotomy opening between an 'anticipated' 'planned' trial and one which was more 'actual' and 'unfolding'.

The anticipated Trial and the actual Trial

As mentioned, the roll out to a full market version of The Cambridge Trial technology and content was to occur over a series of Phases. Each Phase was to be indicative of how the system as a whole was developing - the robustness, reliability and functional characteristics of the technology, as well as the sophistication and scope of the content. The anticipated Phases comprised the following elements and features:

- **Phase one**. This was to be populated mainly with Om designers. Very much in the technology Trial end of the spectrum, it practically represented a period of intense technological development and 'tweaking' of the system components. Om designers as trialists on this Phase meant that rapid development was possible.

- **Phase two**. The population here was a more heterogeneous array of personnel drawn from the members of the CITVIC consortium. Here, the delivery system was expected to be reasonably stabilised, and attention would be concentrated upon content provision, and the more 'experiential' aspects of the system.

- **Phase three**. Was the first instance of the Trial going public. The major issues to be addressed here were modes of payment and packaging of various service options, style and scope of content, as well as how often programmes would have to be refreshed. Success in this Phase would lend credence to the mass market potential of the Cambridge system.

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using computers.

The Phases were to be indicative of the scale of participation in the Trial, with each successive Phase enrolling ever larger and heterogeneous populations. Phase one (starting Sept. 1994), for instance, drew most participants from members of the Om design team and had 10 members. Phase two (starting March 1995), was drawn mainly from the CITVIC partners in the Trial, and was intended to draw 100 members. Phase three (starting at the end of 1995), was the stage where the Trial would first go public, drawing the wider public in Cambridge (at least 250 households). As such, Phase three would serve as the testing ground upon which understanding of 'real' situations of use would be gained. Trialists would serve as surrogate members of the general public, and as such, Phase 3, would serve as the 'launch pad' for the mass market, where system, content, and packaging would be finally tweaked (see figure below).

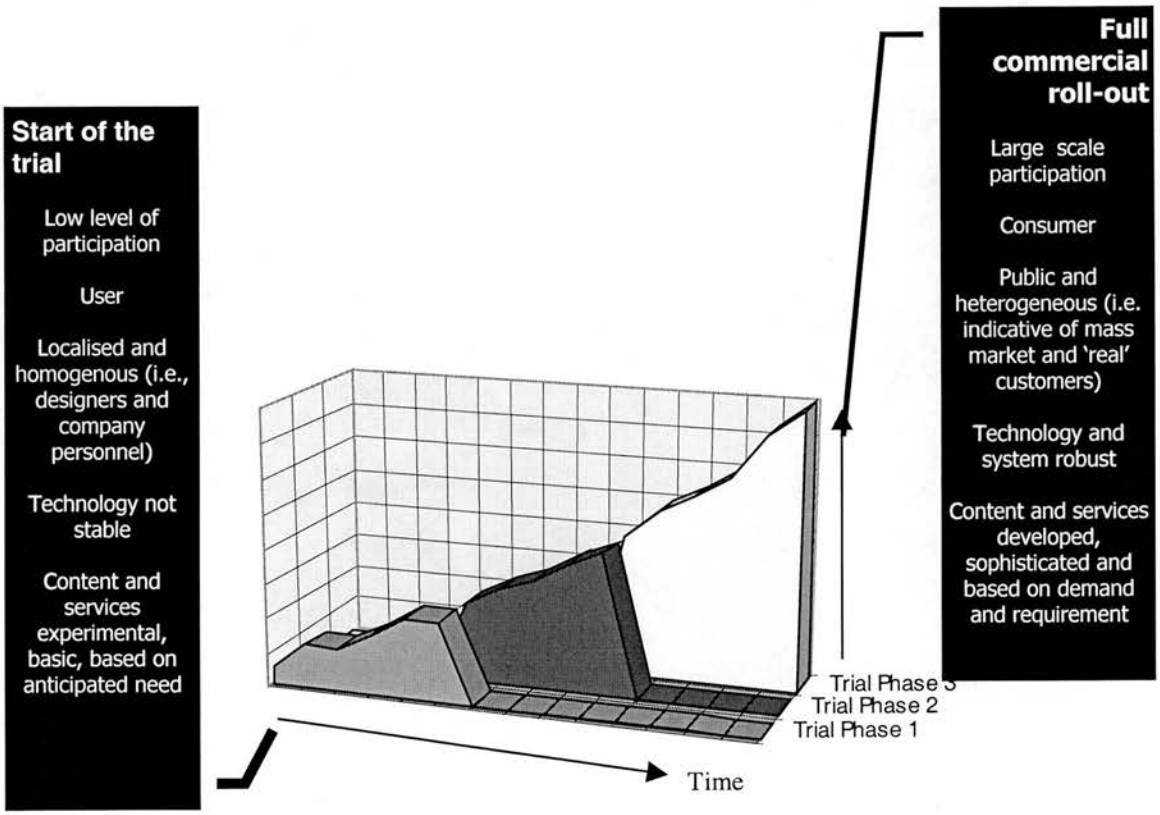

Fig. 7.1 Chart outlining how the robustness of technology, the 'sophistication' of content, the heterogeneity of trialists, was anticipated to evolve over successive trial phases.

In this model, each successive system and content iteration would entail more

targeted development - as the technology would became more robust, the content would more satisfying and richer, and the market (and new ways of attaining market intelligence) would become more fully established. As the Trial developed so the various types of user data would come into focus, dependent on the role of the user (moving from their role as 'user' to a new role as 'consumer').

However, like many of the more technologically sophisticated trials, such as Time Warner's Orlando Trial (see appendix 2), the unfolding of the Cambridge Trial suggested quite a different picture from the anticipated sequence of Phases. The development of broadband interactive television is not only technically sophisticated and socially and organisationally complex - it is extremely expensive.

I felt as if the best plan was to consolidate my revised understanding of what was actually going on in Cambridge, and aim to implement the user research at a time which would reap more 'naive' users (Phase2).

2nd Visit to Om

A month or so later (15th of Oct), after hearing nothing from Om, I received a call. Acorn had a consultant that they had used for various projects, and on viewing my communications and plan of user-research, he had recommended that they offer me a secondment. He was an advocate of QFD, and was aware of the importance of consumer-user input into the project and recognised the lack of this within the organisation. He also understood that i-Tv, being a radical innovation, raised particular issues for design. There were also issues related to the provision of content material and its evaluation. These represented new kinds of problems for methods such as QFD. A comprehensive research approach was required which would not only consider the technology, but the interrelations between technology and media content. This meeting in particular had considerable influence in shaping my thinking regarding the research.

I was unable to take up the secondment offer due to Om failure to provide funding. It

was simply not budgeted in the business plan, and I was unable for personal reasons to move to Cambridge. For vetting participants for phase two of the trial I cut the large media research questionnaire to a one page version. The sample for this phase was to be chosen from a wider range of employees from the consortium companies (i.e. those within and out with Acorn/Om), and it was initially considered that it would be quite large. At this time I was focusing on phase 3 (the public) phase of the trial which was to be the full market test involving paying members of the public. Research on phase 2, was to serve then as a pilot for testing phase 3. I requested for a stand alone demo unit to begin usability testing at Edinburgh.

3rd Visit to Om

I visited Om again on Thursday morning, 1 Dec. '95. I considered that I should bind this with some interviews with trial participants from phase 1. I relied on my Gary Nelson to check on the feasibility of this.

The meeting was attended by a selection of the Om management as well as their consultant, David Byron. Within the meeting it was very clear just how technically orientated Om was regarding their perspective in the trial. Both the consultant and the product development manager were adamant that the real potentials for Om were in the creation of the STB. The development of services they viewed as necessary but viewed that Cambridge Cable would be eventually responsible for these. However, it emerged in the meeting that Om was currently experiencing problems recruiting participants for Phase 2 of the trial. They wished to make sense of the reticence of employees to participate in the trial. They seemed to dwell on issues such as Om's trial objectives, and making attempts to distance themselves from providing content.

I presented an outline and of my evolving ideas of contextual usability. During the meeting the product development manager offered a good example of how usability and usefulness relate to the notion of usage. He consistently took notes on paper, when he (and all the other Om managers) carried Acorn PDAs. He said that he had bought all the peripheral devices for it, and carried it everywhere but had never used

it, preferring to use paper. With respect to the trial the general feeling was that people should pay for access to the trial, as previous i-Tv trials I had cited (such as the Warner Communications QUBE trial in Columbus Ohio) had been non-subscribing experimental marketing and technology trials.

It was obvious that there was no knowledge of the user consciously incorporated into the design, or even in terms of the marketing potential of the system. It was clear that to a certain extent that those implementing the trial had little concept of the image that the technology possessed - ***even within their own staff***.[118] It was my own, and the consultant's opinion that research into consumer-users should be started as soon as possible. Possibly starting with research on consortium members to understand their reticence in participating in the trial.

I put forward that I could begin by conducting basic usability testing on the stand-alone prototype, and in particular the remote control. I also envisaged a series of focus group evenings, advertised in conjunction with Cambridge Cable, where interested subscribers could come in as a group, and where we could run through some experiences. I suggested that I would be willing to run these, perhaps with one or two company observers, video taping etc. While the meeting illustrated the scope and extent of problems which were going at this time, it also provided insights into some of the internal tensions of the project, particularly regarding the passage of documents to myself. These include the first draft of the user manual. The product development manager was not pleased that I had received a copy of this.

Request for a stand-alone unit

My request for a stand-alone unit created further problems between various management functions in Om. The problem was mainly regarding copyright of the branding on the stand-alone model. Apparently there had been some problems with one of the potential content providers regarding the presentations. They had

[118] Apparently people had heard that the service was poor and offered little in the way of entertainment.

withdrawn due to a lack of satisfaction with the presentation of their branding on the stand-alone system. They wished this content removed from the demo. This created the hiatus in them sending out a demo to test.

Early in the new year of 1995, I received word indirectly from Om that there were apparently about 60 volunteers for phase two of the trial. However, not all of these were necessarily geographically viable (i.e. in areas suitable for connection). There were limitations to who could be connected and who could not due to the 'squids' - the kerbside switches which would only allow a number of homes to be connected within a given radius. Cambridge Cable were evaluating which of the volunteers were suitable to be connected.

The volunteers received an acknowledgement, but no questionnaires. I received a communication from Gary Nelson a few days later (16th Jan) which indicated that they were now able to modify a STB for me to use. He also indicated that with respect to recruitment they had now reached around 80 applications. Having said this they were also likely to also be going out to the general public (or at least existing Cambridge Cable customers) to economise on the connection costs. I received the demo STB on the 23rd Jan. and commenced designing the pilot usability testing.

Phase.1 User Research Meeting

At the end of January 1995 I attended a meeting of the Phase 1 users. Much of the feedback concerned the inability of the system to provide for a full movie, and other technical problems which were noted by the attendance of Om design staff. Many of the major problems encountered so far mirrored issues which were being raised throughout the pilot testing (mainly the remote control, lack of positive switching, redundant functionality, difficult to use for games control, desire for some on-screen visual cue of operation, dislike of the double handed design to name a few). Most notable were people's general reactions to the system as not being a particularly radical innovation. They seemed to expect more from i-Tv, such as some facility to control characters within programmes.

Pilot Test with Set Top Box: Feb. - March 1995

In February 1995 I began conducted my lab-based pilot study (on a convenience sample of students and staff). Throughout the pilot testing I was tailoring the procedure as issues and avenues arise. I conducted the lab-based tests with around 12 subjects, drawn from the student population of the psychology department.

One major problem that was tackled was the time the entire test took. With administration of a battery of questionnaires and inventories the test was taking in the region of 3 hours, This was clearly unacceptable for members of the public (who may attend the sessions within their work or leisure period). I reduced this finally to one and half-hours.

I was also at this time beginning to consider a larger scale testing of the stand alone unit with a stratified sample drown from Edinburgh's population. I was very surprised at the fact that there appeared no facility within the university for producing a random sample of Edinburgh's population. Initially, I considered the problem involved in developing an algorithm that denotes a random sample of the general population, the sample being as geographically differentiated as possible. This eventually gave way to a sample based on household constitution, and socio-economic factors. The purpose of this was for a second leg of usability studies which would be conducted with members of the general public. I did this in collaboration with the data library within the university, and intended to send out one thousand letters requesting participation in the study.

A report based on the pilot sessions was sent to Om around the 23rd of March. It detailed the outcomes of the pilot test, and gave indications of how I wished to proceed. I had heard nothing lately regarding how the phase two trial recruitment was proceeding. This signalled a period of relative silence, and a further crisis in the flow of the work. The second time I planned to implement a research programme, which had amounted to very little. However, it transpired that there had been significant

changes in Om as well. During this time conditional access to the users had transferred from Om to the consortium responsible for content and services.

4th Visit to Om: Eric Donaldson

On the 16th May I took up an invitation to go down to interview Gary Nelson and a new project manager dedicated to service provision - Eric Donaldson. He was to oversee the development of content and services, while Gary Nelson was to manage the technical dimensions of the Trial. It was suggested that He would be my main point of contact from now on as he was to be responsible for setting up the user groups of the service nursery. In the meeting he ran through the overall structure of what had been going on over the last few months.

On the day of the meeting - the senior member of the management board from BMP DBB Needham, an advertising agency who had joined the service nursery had come to Om's HQ. BMP DBB were an advertising company BMP was founded in 1968, and now the UK's 4th largest advertising agency. An international company, they had been exploring the potentials of new media, both in their UK operations and their overseas offices in the US. The BMP DBB manager expressed his keenness that I were involved, and would pass on my details to his colleagues who were to work on the i-Tv project.

BMP DDB

In early May I received e-mail from Gregg Rymes of BMP. He explained his particular interest in the trial as gaining an understanding of how - or if - interactive television can be used as a communication medium to meet clients' marketing needs (in the way that, for example, we currently use television or newspaper advertising to meet those needs).

As an account planner, he described his 'bread and butter' work was in developing advertising which applied learning from consumer research. This included the tasks

of identifying the role for advertising within a given project, the appropriate message and ultimately evaluation of consumer response. He indicated that such work is necessarily very task-focused: specific clients have specific projects which in turn require specific research. He envisaged that the same would apply in the case of the Cambridge Trial: They would need to investigate the consumer reaction to each of their client's advertising in a focused way, so as to ensure that we learn what makes a good interactive TV ad, and what to avoid.

He further also had a wider agenda: to understand what place this new medium could have in people's lives, and how they will use it. He was of the opinion that BMP knew quite a lot about how people watch and 'use' conventional TV, but were obviously in the dark with i-Tv. From a purely business perspective, it was important for BMP DBB to get to grips with a medium which could potentially supplant one of their major sources of income (i.e. conventional advertising). He stated that at that moment, they were not "100% sure" of what they were going to do within the trial. They had, however, committed a team to work on the project.

First service nursery management group meeting

There was to be an initial meeting of the management group later that week (May 19th). Eric Donaldson would propose my research to the group.

This meeting apparently went very well in favour of my participation in the user research programme, and the user-research working group. Both the representatives BMP DDB Needham and NOP were described by Gary Nelson as being "very grateful" of the offer of obtaining help and input from my study. The main objective of the user-research working group would be to develop a number of questionnaires and to define the points at which users were to be contacted. Moreover, the group would be responsible to ensure that the approach was co-ordinated so as not to overload participants with too many interviews and questionnaires.

First user/marketing research working group meeting

The intention was that the user research/marketing group would have its inaugural meeting somewhere between May 30th and June 9th, 1995. He suggested that I come down and present a proposal to the group. The next I heard from him was on May 30 1995, when he phoned to say that I should not bother to come to the meeting, which was the very next day. He would propose my work again to this group, and requested that I faxed a one page outline. The result, however, was ambiguous. He had presented the proposal, however he failed to get formal agreement with the consortium regarding access to the users - "this secures your position, once we have minuted agreement." He expressed that this was something he wanted to get resolved and formally pinned down on all fronts 'ASAP'. At this time, it looked very much at this time that I may be excluded not only from attending the meetings, but also conducting trialist research.

More positively was the hint by Gary Nelson that it may be helpful if I and BMP DBB could start thinking about the ways in which our research interests/methods may be co-ordinated. I was particularly interested if they wished to run some test advertisements. I wondered if they had put any ideas of how these ads will, look, sound and interact. I wondered what were their pre-conceptions regarding who, will interact, with what, and when? Their plan for the immediate future was indeed to run some test ads, in fact this was "one of the main purposes" of their involvement in the trial. At this time (May 22nd 1995) they only had a couple of rough ideas for specific brands at present, because in many cases they were waiting to get approval from clients to get involved in (and hence pay for) the development of interactive ads.

They claimed the possession of several research surveys showing that people's willingness (and ability) to interact was heavily biased towards the younger, techno-literate generation, indicating that confidence with, and usage of, technology is greatest amongst the young. Their interests in the research seemed genuinely open, and the notion of basic research into how people were making sense of the system greatly appealed to them.

Gregg Rymes of BMP DBB seemed aware of the limitations of conducting early research using demo and trial systems, he was aware particularly that "any research at this stage may not give an accurate read of the longer term perspective." However, he saw this as "unavoidable." He understood that "whether this is good or bad for the effectiveness of the medium in communicating commercial messages would depend entirely on the particular advertising objectives in each case." His outlook was very much that;

> "If you are trying to communicate a detailed, rational message, such as the benefits of a particular life assurance company, then I would agree that this message might well get lost as people are caught up in the sheer novelty of clicking between screens and selecting icons. However, if you were simply trying to create a leading edge, exciting brand personality for, say, a soft drink, I'd argue that it almost wouldn't matter if every detail didn't get through. The communication would be by association: 'this brand is talking to me in an exciting and novel way, which makes me feel that it's an exciting and novel brand'. In a case such as this, you could say that the medium is the message."

My belief at the time was the need for basic research, viewing i-Tv as a fundamentally new medium and domestic phenomena, and getting a handle on how trialists would make sense of it. This would serve as a suitable background on which to base assumptions of the effectiveness of i-Tv system components (in this case interactive ads.) Some commentators have suggested that it was precisely the lack of basic user understanding that delivered the death knoll on the domestic use of Prestel.

Changing orientation of the user research

This discussion with Gregg Rymes of BMP DBB was significant for the research. It now became apparent that working within this environment of PSPs, suggested a greater shift towards the interpretation and relevance of content material of the systems over and above any evaluation of its technical functionality. This changed the orientation of the research, shifting the focus from usability parameters to a more general consideration of how usability was situated within a complex of interpretability and attractiveness of services, advertisements and interfaces. This

emphasised the contextual aspect of using the service - the core of the approach I was developing during the 'silences' between Om and myself. During these periods I had more contact with BMP and NOP. Their concerns were more focussed on interpretation of content, and more general methodological issues than the usability of the interfaces and hardware. However, Om did remain interested in usability issues, and Eric Donaldson suggested that it may be in order for CITVIC to commission the more lab based work.

I sent a communication to He and Eric Donaldson, requesting whether it would be possible to have a contact, e-mail, phone or address for other members of the nursery group. I mentioned that I had e-mail dialogue with Gregg Rymes of BMP DBB, and would very much like to introduce myself to the other interested parties. While not receiving a direct reply to my request, I did receive an invitation to the next user research meeting scheduled for the 14th June. I was enthusiastic to attend the meeting as my interest was now on following the development of group attitudes and perceptions towards the user research. I was interested in any minutes from the first meeting that was held at the end of May. However, it transpired that minutes were left to the group's discretion themselves, He emphasised that they (Om) did not run the meetings, they merely chaired them. Approval for any movement regarding research implementation had to be confirmed by the group, and the only way to do this was at the meeting. The reply was that I should get in touch with the Cambridge Trial co-ordinator.

Science Museum

There was also an offer around this time to conduct research at an installation of the latest stand alone STB in the Science Museum, as part of a BT sponsored exhibition of new media. It was suggested that I visit a representative of the Science Museum in order to co-ordinate some user research. This was difficult to organise within the time frame which was given (I had about two weeks to do this), partly due to excessive bureaucracy on behalf of the Science Museum (they had a considerable protocol regarding research conducted within the premises). It led to a participant observation

of people using the system within the exhibition.

One of the most interesting observations was an addition to the demo on display. Nat West had developed some content and this was included. It appeared that there was a fault in the program, however, as when one accessed the service it became an automated carousel possessing no functionality by which to stop or otherwise navigate. It worked rather like switching on a promotional video. This 'disenfranchised' the user from any interaction, with the result that people reactions were simply to move on and away from the demonstration. Another distinct problem of arising from the particular idiosyncrasies of this display demo, was the use of an alternative keyboard controller. This did not directly relate to the screen based instructions, whose design was optimised for the Om remote control. This also presented users with severe problems. This was an important commentary on how the technical functioning of the system could most definitely impact more symbolic aspects such as brand and company identity. Recalling the earlier problem when certain potential PSPs were less than satisfied with the presentational qualities of the system to showcase their goods (creating a content problem for stand alone demonstration boxes), here was a case where functionality impacted image. People would perhaps not blame Om or even 'interactive television', for the problems in using, but rather Nat West or other service and content providers.

A final relevant point regarding the Science Museum exhibition - to my knowledge no one from either Om nor the service nursery user research group went to see people use the box in situation. It did present a unique opportunity to view people's reaction to it *en mass*. It was the first truly public demonstration of the machine and could have reaped relevant and interesting data for the service nursery and the technology partners. The lack of capitalising on this opportunity did make me aware of the different motivations regarding developing understanding of the technology and content. And also the rigidity regarding how firms were considering the research.

The autonomy of the Cambridge Trial

Around June 1995, Gary Nelson was charged with the responsibility to produce a business plan for the Cambridge Trial. I received a request from him for data and/or articles useful for supporting his case for the growth of i-Tv. This seemed strange at the time, as I thought that Om would have possessed such information. For instance, they had an extensive press cutting service, and I had seen several reports on i-Tv around. But apparently this was something they were missing. This was the first indication of the breaking off of the Cambridge Trial as an autonomous development and economic entity from Om. I sent some articles that contain some basic figures from several market reports.

Meanwhile, the Gregg Rymes at BMP suggested that there were "striking similarities" between my research objectives and the issues which BMP were keen to explore. He was interested for feedback on a two page outline of BMP's research objectives. These were relatively vague and seemed to echo my presentation at the first user research meeting, and our previous conversations. He outlined an approach in which they would wish to speak to a range of different household types, on a number of successive occasions - very similar to the basis of my research proposal. However, one significant difference was that they did not feel as strongly about ring fencing households in respect to their exposure to on-line questioning, and other techniques that NOP intended using to approach participants. He felt as if there may be some capital in discovering people's reactions to this form of questioning. My original intention (which was to be implemented on the phase 1 users, last Oct. - until I knew they were all closely linked to OM) was to initially present user-consumers with a ramped series of questionnaires. The sequence by which these were administered were:

- 'Filtering' questionnaires that would predicate possible candidates by household composition, computer literacy and gender (in that order).
- The next questionnaire went into more detail concerning media consumption and attitude to technology in general.
- The final questionnaire concerned issues related more to household

sociology.

The basic objective of these questionnaires was an attempt to 'crystallise' previous and existing media consumption as well as attitudes, opinions and interests relating particularly to media, leisure and the sociology of the household. The data gathered by these questionnaires would be compared to further data gathered by more qualitative ethnographic style interviews (over six months or the addition of a significant change to the system) and substantiated by passively gathered data drawn by system registration.

Second user/marketing research working group meeting

The second user research meeting was held at NOP's central London HQ. Present were senior managers of NOP's media research department, as well as representatives from Nat West, Om, the Post Office, and the BBC. I presented my revised research plan (from the previous presentation to the Om management, some six months earlier). This was well received, and encouraged the senior NOP manager to offer the services of staff to help me conduct the project. However, it did seem to encourage some resistance from the junior manager, who had self-appointed himself as chairman of the group (originally chaired by Eric Donaldson).

NOP were to be responsible for the production of an on-line questionnaire which would appear as a menu item on the service. They made an attempt to capture from the group what questions would be relevant. This represented a complex procedure, as most members of the group wanted quite specific sets of questions to be asked regarding their business, and their particular proposals for content and service material. Compromise was difficult to reach, and ended in the chairman indicating that each organisation should only ask one question each. Clearly, such an approach would severely limit the elicitation of useful knowledge.

I raised the idea that people were not joining the trial simply in order to be asked questions. They had joined for reasons of curiosity, or some perceived benefit, such

as entertainment promises etc. I suggested that it was important to try and capture general impressions of the service. This may indicate aspects of the service as a whole which were strong and weak. Some may be technical (i.e. control and usability issues) or to do with content (pleasing, informative etc.) or simply to do with the 'feel' of using. From this as background, more specific questions regarding aspects of the system could be explored. However NOP's investment in the trial was precisely to explore online methods of data production and collection.[119] They appeared somewhat unconcerned regarding the content and substance of the questioning.

Following this meeting, I contacted Gregg Rymes of BMP DBB on July 6th and indicated that I saw two levels of involvement in the research project; one was conducting the research itself, and the other the other was the setting up of an 'interpretative group' which would analyse and develop themes from the transcripted data. A senior NOP representative present, said that NOP had 20 or so qualitative psychologists and offered a more senior person to work with or a less senior person to work for me in conducting the ethnographic study. I suggested that due to the elongated time span involved we should try and use people who can commit to carrying through the project to the end, certainly from the interviewing position. There was also a strong case for all ten houses done by the same team, the team being small (no more than two or three), and being gender balanced (i.e. male and female).

Later that day, I also contacted Om (Eric Donaldson) on to enquire on how the recruitment was going for Phase 2. I mentioned that I had conversed with BMP DBB Needham, and we were now wondering if the ten houses for the ethnographic study could be chosen. I informed him of our intention of working collaboratively on the project with NOP. He replied the following week to say that he had missed the last Market Research meeting, and he was unaware of any notes taken from the meeting.

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[119] It is perhaps more accurate to say that they felt confident that they would develop understanding of the trialist's attitude, as well as experiment with new forms of online market research:

> "Our role in the Cambridge trial will be to help research the i-Tv users' attitudes to the services available. We will also be developing ways of downloading market research question to i-Tv users . . . We believe this new interactive method of research would be a huge leap forward for the industry and we want to be involved from the start." Director of Media

He was "completely unaware of any "ethnographic study"". No one from either BMP or NOP had mentioned it to him. He further requested that whoever is most appropriate to call him, if any action is needed from himself. So far he had had not received any requests.

This last comment was indicative of the way in which my first point of contact with the trial had now quite evidently shifted from Om to the user research group, and how the dynamics of this organisation (particularly who was in control, who to contact etc.) were becoming more hazy. Seth Paladopicous, the chairman of the group, was either other indisposed or was not forthcoming in conversation. In a telephone conversation with him, he reiterated that "there were many interests expressed by the group." I interpreted this as suggesting that only the group when in session was able to establish policies and actions. He further reminded me that those companies involved with CITVIC had paid to be members and to conduct research. He seemed little concerned that BMP and NOP qualitative were anxious to go into the field. From his perspective the group had not decided to go ahead with any research, bar what they (NOP Media) had proposed. NOP Media seemed to hold the reigns on not only on user group agendas, but also on interpreting the outcome of group business (which due to the lack of minutes seemed impressionistic at best). I further learned that NOP qualitative were a separate division of NOP, and as a separate department, were effectively getting little in the shape of payment for this study. It followed that they had little motivation to work or commit to the project.

There seemed to be a further crisis looming. As an act of desperation to get some movement and clarification regarding what was happening, I sent some of the dialogues and have been going on the last two or so months between myself, BMP, and NOP qualitative to my original Gary Nelson - Gary Nelson. In the light of having poor intermediaries in the form of Eric Donaldson, and Seth Paladopicous, I wished to explore if there was anything he could do to prompt action.

Research at NOP.

NOP Qualitative

As previously mentioned, I had already been in touch with Celia Smythe , who was associate director of NOP's qualitative division. I asked The Gregg Rymes of BMP DBB if I could pass on some of our discussion material in order that she could get a handle on what we want to achieve. I further suggested that we have a meeting soon to discuss this approach. I also wondered if she knew any more with respect to Phase 2 recruiting levels.

From her I gathered that the launch of this phase 2 was being put back to the end of August 1995. She felt that this left plenty of time to get together over methods and style of approach. I was becoming very conscious of how the organisational details were beginning to dominate the user research in more ways than one. I was really hoping that myself, NOP and BMP could open up communications, such as e-mail discussions cross posted to each other. Here we could discuss issues regarding the qualitative research programme.

BMP indicated that they were "very willing" to join forces with myself in the 'ten households' project, and keen to open dialogues. They agreed that it was perfectly fair to ask for consistent involvement of personnel throughout the trial (With the one proviso that BMP's position as sole advertising agency participant is limited, initially at least, to twelve months.) Gregg Rymes of BMP DBB was sure that NOP would wish to get involved, particularly in their capacity as co-ordinators of the market research subgroup. However, he was not so certain at this time whether they would actually 'get their hands dirty' with the fieldwork itself - they are mainly a quantitative research agency. He mentioned that he and his colleague may well also wish to supplement the 'ten households' project with further ad hoc qualitative projects to address particular issues, but if so, it obviously need not influence our continuous project.

He also mentioned that we were now at the stage where we should try to arrive at a definite plan for conducting the qualitative research. He wished to know if I had

progressed things further since the last meeting – i.e. had I a set of ten names and addresses? Additionally, they asked if I proposed to draw up a discussion guide for the first session. They were very keen to agree the practicalities of how we would conduct the research - if for no other reason than to set time aside in our diaries. It was difficult to set this time, as it was becoming obvious that the circularity of the power relations which were forming, were protracting relatively simple tasks.

He informed me that NOP had devised an 'establishment survey' which he felt was very similar to my own "media and leisure questionnaire." This was also designed to be sent to participants before deployment of the system. He presumed that I would prefer that to be used instead of NOP's survey, in order to keep the households' research burden to a minimum.

Group communications

As indicated, there was a distinct picture emerging that the group communication flow was being greatly hindered during this time due to people constantly 'passing the buck' to others. Gregg Rymess on phoning Eric Donaldson at Om to get an update to find out how recruitment was progressing, had now been referred to NOP for that information. There he spoke to Celia Smythe who in turn had to speak with Sidney Green/Greg Paladopicous to get an update on the progress of recruiting trialists, and hence to give us an idea of likely timescales for conducting the fieldwork. One other, and most significant event from my own perspective, was that Gregg Rymes of BMP DBBs was of the understanding that that Celia Smythe was proposing that NOP provide all the interviewers. From his point of view he supposed that this would "certainly save us the hassle of repeatedly travelling to and from Cambridge!" From my point of view this became ever a further threat to my efforts to access users.

I received word from BMP (11th Aug) to the effect that NOP seemed to be suggesting that they conduct the interviews. I emphasised the point that I sincerely hoped, in the light of having no direct access to users, that my request would be granted for the interviews to be audiotaped and verbatim transcripts being made of

each of them. There had seemed to be some reticence on the part of Celia Smythe to do this because of resource and expenditure implications. As mentioned, NOP qualitative, as a separate department were not being paid for this work (from Greg Paladopicous). She seemed to prefer a looser 'real-time' note taking procedure. This involved interviewing people very casually and 'lifting' out relevant points or statements as they emerged. Such a procedure would severely restrict possibilities of alternative or secondary analysis. I offered to transcript the interviews, and requested that at least they be recorded. It may be that NOP qualitative's suggestion of note-taking may provide the level analysis required for business use, but recording the interviews leaves open the potential for a 'deeper' readings.

Gregg Rymes of BMP DBBs and Wilkins of BMP met with Celia Smythe on the 15th Aug. According to Gregg Rymes of BMP DBBs, it sounded like the recruitment of trialists was making very slow progress. Om had only 63 trialists signed far, far from the initial target of 100. NOP intended to 'ring fence' the first hundred for the quantitative research programme (the online questionnaires and sys-log data). This suggested that the qualitative research sample would have to wait for extra households over and above the hundred. At the time exactly when this would be was not at all clear - potentially, it could mean that we have to wait until late September or even October. Celia Smythe also indicated that Om were now aiming for 250 trialists rather than just 100, so recruitment would be constantly continuing.

Gregg Rymes expressed his hope that our having a dedicated qualitative sample would mean that our respondents could also be ring-fenced from external influences. Out of the meeting they felt that an ideal number of participating households would be 16; an acceptable alternative would be 12. These would be divided between a spread of household composition types (determined by NOP qualitative):

3/4: 'pre-nesters' (i.e. singles or childless couples)
3/4: households with kids aged under 10
3/4: households with kids aged 10-16
3/4: "empty nesters"/households with grown up children

They also hoped to include within these a mix of households who had been given cable TV channels for the first time as a result of participating in the trial, and households who already had cable or satellite. The expectation was that there would be a significant difference between the attitudes and perceptions of i-Tv between these.

Early analysis suggested that those who had already been recruited were heavily biased towards the AB socio-economic categories. Apparently this was unavoidable since the existing cable network passed through mainly upmarket neighbourhoods. As a result, the sample was likely to be skewed towards more affluent households rather than representative of a wider television public.

As regards the practicalities of arranging this project, the following logistic suggestions were made. NOP will provide two research executives who would cover at least half of the interviews within each wave of the research. The remainder was to be conducted by Celia Smythe herself, plus myself if necessary. I would be given an option either to accompany people on these interviews, or conduct some by myself. Each interview would take place with all those members of the household who had used the i-Tv system, i.e. adults and children together. All interviews would be audio taped, and I was to be sent the cassettes for transcription.

At some stage all the participating researchers would need to meet up for an analysis/interpretation meeting. It was understood that I would want to produce my own forms of report on the basis of this work, while NOP and we might decide to summarise it more simply. NOP was also to provide a 'recruiter' - Phoenix Fieldwork Ltd. They would contact those households that are allocated to us. They would ask them to participate in our project, and arrange the times for the interviews. It was also suggested that we send each household a very basic viewing diary for them to complete during the week prior to each interview.

At a further meeting Celia Smythe made one or two observations, which was

circulated via e-mail. These were;

> 1. We need a clear statement/list of objectives to work to
>
> 2. We discussed viewing diaries, are we going to go ahead and use these at all?
>
> 3. Resources, a bit of confusion here
>
> a). NOP were able to cover off approx. 6 interviews per wave using executives and this includes any that she may be able to conduct herself. The remainder will have to be completed by other project team members. Bearing in mind this is likely to be a 3 wave project she felt that the '6 interviews per wave' offer is a considerable commitment of resources bearing in mind cost implications and budget.
>
> b) Recruitment. NOP can recruit the initial sample, but she felt that subsequent appointment making and scheduling needs to be done by myself so that fieldwork is controlled from a central point and timing is kept a careful check on.
>
> Do phone or send e-mail if you have any queries. I've copied this message also to Derek
>
> Greg Paladopicous had also informed her that the next research sub group meeting will be on 13th September at 10am at NOP Covent Garden.

My feeling with all this was that we were making some progress, but I wondered if there really was a need to segment the small sample, especially since it is not going to be the same researchers doing every participant for each wave.

On the 1st Sept. Gregg Rymes replied to reiterate that it we would have to wait until Om recruited 100 households before we would have access to anyone. His perceived logic of this is to avoid overloading the trialists with a huge research burden "bearing in mind that the first 100 will continually be interrupted with on-screen questionnaires, as well as being roused from their slumber at 2 am to explain why they watched an adult movie!"[120]

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[120] He was referring cynically here to a claim by a NOP representative, that they would consider phoning people while they were watching programmes to ask them how they were enjoying it etc. This was contested at the meeting by the Nat West representative who remarked that he may be watching

2nd User research meeting

Gary Nelson wrote to let me on the 10th of Sept. to inform me of the next user/marketing research meeting. It appeared that my name had been omitted from the list of participants and he wished to find out if I had heard about it. I mentioned that I had via the people at BMP (who had in turn heard of it through Celia Smythe at NOP).

The members of this meeting included representatives from NOP; Post Office; Tesco, BBC; NatWest; Anglia Multimedia; BMP; Education Online (Acorn); ITC. Leading up to this meeting I was contacted by Seth Paladopicous to say that he felt that I would not get much from the meeting, as it would be concerned chiefly with quantitative material. I indicated that I was interested in all aspects of the user research, not only the qualitative work, and was interested in attending. The meeting convened with people stating the names and contact addresses of the various trial partners. Michael outlined what NOP had done so far in terms of 'research development' and distributed packs that consisted of some 20 or so sheets of statistical breakdowns pertaining to each of questions asked in their 'background study'. The 66 households were represented within the study as both numbers and statistical proportions.

From this data, an immediate problem was recognised by Nat West. There were few trialists which had accounts with their bank.[121] This seemed on the surface something of a fundamental point that perhaps should have been addressed at the recruitment phase. Trialists, to use the banking service (and of course to provide feedback on the quality of that service – the motivation for any PSP participating in the trial in the first place), would have to change banks or open a new account. People have particular relationships with banks which would open entirely new set of questions

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adult movies with his friends on a Friday night and if NOP phoned him then he would not be happy. This is a significant point to note. It indicates something of the differing relations which various firms had towards what was morally and ethically permissible to do with the trialists.

[121] "Our primary focus is to understand how consumers will take to this type of banking" Stuart

regarding behaviours and actions.

More generally, there was consensus regarding the entire group's commitment to sys-logging as an effective means to generating the participants reactions to the system. However, there still seemed considerable work in terms of building the software tools which would be able to analyse the raw data which was being produced by the system. Nat West also raised some questions regarding the security issues, and that logging data pertaining to their service would have to carry guarantees of privacy. They did not want logging data regarding their service to be public shared knowledge, even within the user-research group. The question of the qualitative research came to the fore, in terms of it helping to augment information produced numerically by the system. There seemed a unanimous opinion that the qualitative research should be implemented ASAP.

In comparison with Greg Paladopicous 's emphasis that this was a meeting dedicated to quantitative research, the meeting was dominated in an interest of what trial participant's reactions were generally to the i-Tv system. It was felt that the qualitative research offered the most immediate avenue to acquiring this and the feeling was that this should progress, ASAP. Greg Paladopicous indicated that NOP were looking into this, and would send information out with respect to how it was progressing. The Om representative indicated that it was unlikely that they would raise anymore than the 66 trial participants, they had simply run out of funds. In the light of this, I advanced to the group that I was ready and willing to go and interview at any time, and that we should not have to wait for quotas of participants to be ringfenced for purely quantitative studies. In the light of developments, this appeared welcome.

By the 2nd Oct I decided to get in contact with Gary Nelson again. I had phoned him repeatedly and left messages on voice mail. I mentioned the outcomes of both the previous user/marketing research meetings and the apparent agreement to conducting

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Chandler, Nat West's deputy chief executive cited in *CSCI* March 1995

the qualitative research without waiting for 100 participants. This communication had some positive effect. He had spoken with Eric Donaldson, who had subsequent talks with NOP and BMP DDB. These discussions had clarified the outcomes somewhat. I was to contact the group through a further person - Louise Edgley at Online Media, who was handling "recruitment and customer care."

From his understanding it appeared that NOP and BMP DDB were relying on ***myself*** to organise the research group and arrange the interviews. Although perplexed with this reply, I stated that this was perhaps a good idea, since I probably had the most full time involvement. In respect of the question of interviewing users before being connected, he said that this was "trickier, but probably OK". This was something that I had to speak with Louise about.

It was suggested that it would be helpful if I produced a plan for the Qualitative Research activities, with the following sections:

Project Title

<title

Brief description

<brief description of activities and objectives

Motivation

<main reasons/incentive for the project

Technical approach

<overall technical approach of conducting the interviews, when, how often etc.

Deliverables

<detail key deliverables by way of research reports, enhanced questionnaire etc.

Outline Schedule

<key milestones with dates

Resource Requirements

<identify personnel involved (name, organisation), and any other materials or tools required to implement the project

(n.b. The above project plan should only be about 2 A4 pages, but I believe this will help to focus the activity and will be extremely useful to present a solid project for this activity to the PSP partners.)

I wrote back the same day confirming that I would produce this document ASAP. However it did seem to be structured rather like what had already been sent several months before. I was more optimistic that we were indeed witnessing movement. However, phoning Louise Edgely I found that she was very difficult to get in touch with as well. The next communication was from Gregg Rymess (Mon, 23rd Oct) saying that he understood that Eric Donaldson at Online Media had now given formal approval for the qualitative research with trialists to begin. The next step was presumably to contact the trialist households, arrange convenient interview times.

Speaking later that day to Eric Donaldson I was reminded that any decision to move on this issue was up to the group, who after all were paying members of the service nursery and who were, by this time, largely funding the trial. It was clear that I would have to get the endorsement of BMP, who were subscribers to the nursery to then get in touch with Donaldson. Donaldson then sent an E-mail to Seth Paladopicous to say that he had chatted with someone at BMP that afternoon regarding the initial "first reactions" qualitative research that was agreed on at the last Research working group. He suggested the following action plan:

> "Louise Edgley at Om has already sent all of the dates that households finally went "live" to Melanie Cook (at NOP).

If John, Laura and Derek decide (based on whatever criteria they wish, but including a minimum period of having been live) which families they want to talk to (10 was suggested), and some possible dates for the interviews, and tell Louise.

She will check to ensure that the families haven't e.g. just had 3 press interviews in the last week (it's starting to happen!!) and co-ordinate dates with the families - most of them now know her.

We have also now had a number of comment forms back from users - these can also be made available. If any of these refer to particular PSPs services, then they are automatically passed on, but so far most are pretty generic.

I suggest someone (Derek?) examines these on behalf of the group and produces a written summary/analysis - rather than circulating them to everyone."

The next contact was the 29th Oct, when I again spoke to Eric Donaldson by phone. He informed that I was no longer welcome to turn up at user/marketing research board meetings. Apparently, "several members" had expressed their concern of the way in which I was "holding up the research process". This was contradictory to my experience in the group and direct communications with some of its members (BMP DBB Needham and NOP qualitative). He indicated that NOP's Seth Paladopicous alone that had been responsible for the allegation. His reply was that I would be involved with the research, but that the best plan just now was to let the group go on its own way.

On the 9th Nov I received a copy of the of the mail which was sent out to Research WG members;

QUALITATIVE RESEARCH
==========

It was confirmed at the Research Working Group meeting on 1-11-95 that qualitative research should go ahead as soon as possible.

I agreed that I would detail the approach we discussed, as follows:-

NB - Part of the process is designed to ensure that the identity of families c.f. their detailed sys-log data is never revealed to PSPs.

1) NOP to supply PSPs with anonomised demographic data on all families whose systems are now live.

2) Om to augment that data with dates on which the system went live for those families.

3) All PSPs to advise Jon Wilkins of BMP of the demographic (or other) basis on which they would prefer to select (say) 10 families for a face-to-face interview, as well as the issues they would like to have investigated during these sessions.

NB - No target date for this was agreed at the meeting, but I suggest that everyone gets their input to Jon no later than Friday 10th November. As usual, no objection implies consent.

ACTION - All Research WG members

4) Based on this, Jon, Derek Nichol (Edinburgh University) and Celia Smythe (NOP) to produce a *very* sort outline of how they propose to carry out the interviews and what they hope to illucidate, for a quick "OK" from the Research Working Group.

5) They select target families from the data supplied by NOP and Om (by code number) and pass to Om, who will (a) check that there is no reason why a particular interview should not be done (only in very exceptional circumstances) and (b) coordinate arrangements with the families.

6) Interviews to be coordinated between and conducted by Jon, Laura and Derek, who will report back to the Research WG ASAP after completion.

Eric Donaldson
9-11-95
[note; the above is a direct copy of the e-mail received and includes original typos]

Will Colin got back in touch to enquire if I had received the e-mail sent 3 days before (dated last Thursday, 9th Nov). This apparently gave the go-ahead for the qualitative research once the PSPs (i.e. Tesco, the Post Office, etc.) have given their views on the types of people they would prefer us to talk to. He said this should happen by this Wednesday (the 15th Nov). They also were indicating their frustration with the lagging research process; " . . . perhaps we might be starting to talk to people at long

last."

There was no reply to this request and Jon Wilkins had a further meeting with Celia Smythe on Dec.7th. Again, to discuss how to get the interviews underway. Reiterating my points which had been sent out some months ago I sent a letter detailing what I considered important in the approach to the users. I stressed the requirements for the sample, and suggested the contextual usability use categories as a blueprint regarding the questions asked in the interviews.

The sample

On the 14th of Dec, I received a copy of the mail sent to Jon Wilkins at BMP from Eric Donaldson. It basically detailed Om's suggestion of trial households. At this time they had not be contacted. Louise Edgley at Om, was to schedule the interviews for us. The number donated the identity of the household.

F002 2 adults, both working. No children at the address.
F010 Couple, 2 children (1 boy 1 girl). She - solicitor, he - local Councillor
F011 Couple. 3 older children 1 of which is studying.
F016 Couple, 2 children.
F018 Young couple, not married, both working
F019 Single male, working.
F025 Couple, both elderly & retired
F028 Couple, both elderly & retired.
F033 2 adults, single, studying
F040 Couple, 1 child age 13
F071 Couple, Both working.

On the 19th Jan 1996, Eric Donaldson informed that they had not started the interviews as yet. "but they should be close...!". He also had an interesting proposition regarding the SYS-LOG data. They had been "pouring over the voluminous stats" that they had been collecting, and he wondered whether I would be interested in "trawling the data to try to extract behavioural meaning?" He wished to "talk through the implications - like do we have all the tools we need, data protection, etc." He attached an e-mail to illustrate what he was thinking of:

Fri, 19 Jan 96

Imam,

How much work to put something together to produce a sort of pseudo-replay facility, that runs through the sys-log file and puts together a storyboard for a particular STB, e.g.

Family number 20045

12/11/95	10.34:23 Box booted	1:05
	10.35:28 PIN entered	0:17
	10.35.45 Main menu	0:04
	10.35.49 Leisure	0:09
	10.35.58 Go Fishing	12:23

etc etc

Last column is the time in minutes and seconds spent in that level or video etc.

I know you don't have all the info implied above, but we should be able to get fairly close.

What do you think? Would be very useful in examining the bahaviour of a particular family.

Alan

PS - If you can crack that, how about a real replay facility!!!!

This was a significant development within the user/marketing research story, as it seemed that now I was also to be presented with the quantitative data of the trial.

Eric Donaldson had checked Om's proposed list of families to interview as requested at the 4th user/marketing research meeting in early January 1996. They did seem to represent a good spread of usage from heavy to light. Minimum non-zero monthly usage was in the range 50-100 minutes, maximum was over 2,000 minutes. He

recommended that we moved ahead with interviews using this list (assuming Louise could persuade them all to agree). He also requested that we decide how and when you would like to do the face-to-face research? This was now to be co-ordinated through Jon Wilkins as agreed at the research meeting. Jon was to get back to He ASAP with the group's view?

There was to be a fifth meeting of the user/market research group on Tue, 19th Feb 96. This was where Eric Donaldson was to ask the group's permission for me to conduct the analysis of the quantitative data. However "the buggers cancelled it at the very last moment!", and this entailed a further hold up on that front. However he was going to fax them the next day and say "I intend to do this - react by xxx or else."

By the end of March there had still been no movement on this (as there had been no research group meetings). However, two Om staff Alice Hodges and Imam Khan had finished off the software to analyse SYS-LOG data. Alice had been testing it out from the point of view of "what can we infer?" And the "answer seems to be - quite a lot . . . she was running an interactive workshop for some of the companies today, and that's shaping her ideas on the best way to go. I'll get her to give you a call in the next few days (to brief you on experiences and directions to think in) and see if we can get the data and tools shipped up to you when she's despatching the next batch to the partners." I never received any phone call, nor did BMP receive any of this data.

The next communication was in May, where again Eric Donaldson indicated that Alice Hodges will be sending me the tools and the data shortly - she will call you. It was also stipulated that before she despatches these, there was "a few conditions you'll need to "formally" sign up to for commercial and data protection reasons." Eric Donaldson indicated that he was leaving Om shortly - and that Alice would be my main point of contact from now on. To date I have several phone conversations with Ms. Hodges, who has indicated that she must secure permission from her up-line manager at Acorn to send me the data.

The user research

The qualitative user research was finally conducted in collaboration with personnel from BMP and NOP Qualitative. Participants on the Cambridge Trial, were interviewed between the 23rd and 24th of July 1996. The 11 (of an intended sample of 12) households were selected from the 66 participants in the trial. Phoenix Fieldwork Ltd handled recruitment. The shortened transcript interviews and their analysis is included in appendix 1.

The objective of the qualitative user research was to understand the trial participant's understanding of the technology. To uncover something of the way in which participants came to learn of the trial and the technology, and of their interaction with the content and services.

The sample was recruited by a London-based fieldwork recruitment agency used by NOP - Phoenix Fieldwork Ltd. These were responsible for contacting those households that were allocated to the qualitative study, asking them to participate in our project, and arrange the times for the interviews. In the case of my interviews they had unfortunately failed to confirm the interviews on the day, thus on arrival at one of my households at the appointed time the interviewee was found to be out. The other interviews, although completed, had to be rearranged from the scheduled times. This was because people were not available due to their own rearranged plans, family in hospital, and one household busy making dinner for their lodgers.

The 12 household were evenly divided equally between the three participating research teams -myself, NOP and BMP DBB. We each had a discussion/checklist which was drafted by myself and BMP DBB. This was of importance in this study due to the use of multiple interviewers. Interview guides provide some element of standardisation across interviewers, where their approaches, manner, appearance, communication abilities etc. may vary (Robson, 1993: p236). The guide had emerged from sharing of issues (see previous chapter), and substantive work I had done in the way of questionnaire development. The intention was that this would be

implemented in a open ended way to promote discussion of the use of the system.

In each case, all the of the family present were presented with the questions. Answers were spontaneous and sometimes negotiated and/or contested. Most households had been contacted by Om in April 1995, and connected in September 1995.

There are several themes recurrent throughout the case studies. Broadly these can be broken down thus:

- Lack of content drove inactivity with the system.
- Regardless of problems with content most people still saw value in such a service providing there were programmes which would appeal.
- Most people saw advertising as inevitable, however interactive advertisements were difficult for them to grasp or imagine. As a concept they seemed to appeal, providing they did not interfere with the programme.
- i-Tv would not impact on their choice of viewing, rather the flexibility it afforded (i.e. on-demand programming) would enable them to view when convenient dependent on other leisure time activities.
- It was quite obvious the family homes differed from each other in terms of uses for television, and that these homes differed form their extra-television activities, in ways which would be relevant for the consumption and use of particular services (i.e. some services simply did not 'exist' for certain households).
- It was quite clear that interactive radio was of little interest to interviewees

The qualitative interviews conducted with trialists reaped little in the way of directly relevant data suitable for innovation either of content or technology.[122] This is why, rather than accented within this study, they have been relegated to an appendix (appendix 1). The main problem was clear and straightforward - there was a lack of a cohesive service, useful or entertaining enough to motivate use. A symmetrical of notion of evaluating design (intentions) and use (interpretations), was completely

[122] This is not to say of course that the study was redundant within itself. It could have provided a more substantial basis for further research taking into account wider perceptions of media and domestic

unbalanced by the multitude of intermediate technical, financial and organisational problems that plagued the trial.

Conclusion

The changing contingencies of the trial - who had stakes in what, their own drives and motivations, their overall interest in making the trial work, and what their particular learning objectives - impacted the implementation of the research or the crystallisation of the working 'images' of technology and users.

This chapter showed the importance of understanding the contexts of organisational, administration and management aspects of trials. What eventually evolved as user research from the constituency of the Cambridge Trial was definitely hindered by the institutional structures that emerged. Generally, the order of the day was 'learning by doing' or 'learning by struggling'. This was practised with respect to technical *as well as* social innovation on the trial. Lack of proper governance of the trial, consisted of little more than ground rules produced by Om's Eric Donaldson for the working groups.

One of Om's main priorities, for instance, was making the trial economically autonomous, whilst simultaneously developing diversified markets for their technology (including the RISC PC as the sole means for authoring i-Tv material).

Nevertheless, there seems a rich lesson to be learned in articulating the social elements of their constituency building effort, in addition to their technology development. However, this has often no resources afforded to it, and at times in this particular case it appeared as if Om were treating the social construction much in the way in which they would develop software system architectures. However, social solutions leading to the successful development of new media partnerships seem more tied to existing structures, and considerably less viscous in their movement, than the tremendous pace at which technology solutions appear. Markets and

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technology.

business and social solutions are also more complex, than many models suggest. This seems particularly important in the manufacturing of new mediums, where the technology is an arbitrary, or at the very most facilitating part of the overall usefulness and value of the system.[123]

Innovation often results as a unique configuration of many parts and functions, which independently may have been developed for entirely different end-purposes and uses. Many firms are working towards a 'mass' age of new media. However, the Cambridge Trial was a particular socio-business experiment. Each trial, even if it were using the same technology could be entirely different in nature, reaping entirely different results based on social and cultural contingencies. While trials may have reasonably clear and well-defined objectives, they remain technically and socially experimental. The elucidation of results and the ways to achieve them seem often ill-defined. Even in the early experiments in i-Tv, such as Winky Dink, cited by John Carey (1996), there were problems with children drawing on the TV screen directly rather than with the pre-pared screen cover they were 'supposed' to use.

Simon (1969/1996) draws attention to the question of how a simulation can generate new knowledge. Simulation is used to achieve and predict the behaviour of systems. To a large extent, and as was implied through Om's focus on technology in chapters 5 and 6, the users were viewed almost as intelligent parts of the system. They were viewed as data generators, from which inferences were to be made regarding tweaking the system, its look, its offerings, its functionality and so on. The trial content was only ever a demonstration. It had many promised features that never materialised and this was the single most represented piece of feedback consistent across all interviewees. Simon relates two assertions about computers and simulation:

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[123] This evokes notions of the debates that continue between those advocating that 'technology is king' over those others who claim that 'content is king', or other still who see that 'connectivity is king'. My own view follows Saffo (1993) who claims that 'context is king' - i.e. it is **all** the elements which needs equal attention in the creation of viable new media. There is little benefit in having a top quality hi-fi amplifier if one only possesses a cheap pair of speakers. Likewise having a powerful STB is of little benefit if one has no content, or one cannot connect enough homes to persuade major content providers to deliver.

- **A simulation is no better than the assertions built into it.**
- **A computer can do only what it is programmed to do.**

Applied to the Cambridge trail this may be taken to infer that the point of view of Om, and even the companies involved in the trial, that since it was only a simulation - a demo - that no useful information could be drawn from research. The user research has offered a glimpse into the often non-rational, very diverse and individualistic lifestyles which are recognised within consumer research, and only now being recognised by those who developed technology which is to be situated within domestic locations and real lifestyles.

Erlandson *et al* (1993) point out that in naturalistic research analysis is continuous, that the "analysis of data interacts with the collection of data." (p.130) This suggests the flexibility inherent in this approach. Subsequent interviews are shaped by what has been learned from previous encounters; interviews in process may change with respect to what is being offered by the 'co-researcher' – the 'subject' of intreptist-style studies. New opportunities for data collection are sized upon as they occur and are considered relevant. Such an organic approach maximises the research process within real world and often chaotic circumstances. Research and analysis are never fully complete, there is always something, some angle which was not fully exploited or explored. This was the case in the user research of the Cambridge Trial. The research process was in the end compromised. The reasons for this compromise maybe summarised thus:

1. The employment of a semi-structured interview schedule. While this permitted some degree of standardisation of the results, it also challenged the notion of natural trajectories within the interview process. As such they were guided to irrelevant questions (such as asking about their impressions of advertisements which were not on the system), and generally swept along with the pace of the questions as laid down by the schedule. There was some evidence of answers being 'invented' or 'forced' for questions.

2. There was a definite lack of consistency between the interview styles of interviewers. This resulted in some interviewee answers being closed down on points they perhaps wished to emphasise, possibly due to the interviewer's notion

of what was relevant or non-relevant to the discussion. Different interviewers have different ways in which they communicate with people in intimate places such as their homes. It is quite easy to imagine that some researchers have particular talents for making interviews feel relaxed and open, free to present their 'genuine' impressions on phenomena, whereas others may unconsciously act to inhibit the free flow of thoughts and feelings regarding subjects. This is an unforeseeable problem which none the less must impact much of human subject research, and is itself an artefact of insurmountable individual differences and experience.

3. Logistical difficulties plagued this project due to the inclusion of a third-party firm for arranging interviews. As noted I experienced difficulties (fatal in one instance) with my interviews, and it was only down to luck and the flexibility of myself and the interviewees to reschedule and fit in the interviews on spec. It is not unreasonable to imagine myself flying down to Cambridge on that day, only to return with no interviews whatsoever. The use of such interviewee recruitment agencies seemed common practice to NOP, who obviously use this company on a regular basis.

4. Semi-structure interviews presume something of the communicative abilities of the interviewees. Those who are more 'vocal' and can articulate in a much more richer way than others may tend to dominate at the level of analysis, particularly when this is done at the casual level. What was indicated from NOP was that the interviews would not be subjected to transcript, and that for their purposes it was only necessary to lift out sentences taken from listening to the recordings. Such a method may leave itself open to reporting on the feedback from certain interviewees over the subtler, but nevertheless relative, feedback of less articulate or outspoken interviewees. Such a problem is of course framed within the larger, more pervasive difficulties of the interview process as a social science research implement, but attention to questions of interviewee articulation should perhaps be made to frame each of the interviewees' responses. This could be derived from realising the benefits of a more discourse rather than simply content orientation at the analysis stage.

Marcus Penny viewed that within the relations of user to marketer there lay an issue - that of bringing the user's interests into this in an appropriate way. In particular the issue that Penny faced was financing some consideration of the user's interests at all. Everything that he did had to financed and justified in some way. At that moment he was financing and justifying it on the basis of service providers and Om, learning from the process of the trial and the lessons that this taught in terms of how to build businesses in the future. What value was there to service providers in consumer's interests? Who were the institution or firm who would pay for this?

One could imagine that a public sector institution such as the Independent Television Commission (ITC) or some of the consumer watchdogs could become interested. They may be better placed to conduct independent research. Penny felt that this is a generic problem with all products and all services in that the users in the end do not finance it. At the creation stage you have got to deal with the people who are financing it, these are the people who are actually interested and engaged in its development at this point. They are the people putting their time and effort and investment in on the basis that they produce services to users. Out of that there is a motivation for them to get a real understanding of what the users actually want. Penny thought this is something that you could sell to them if they understood what users really want they will do better in the provision of services.

This seems to be one shortcoming of group decision making processes that is classic - some processes apparently give rise to spontaneously good products as was the case of the original demo STB. A worst case scenario is also possible however where you have got a bad product which fails to satisfy both the collective needs and individual needs of the group. This may be true, as in the user/marketing working group case where the product is a research approach the difference is this product is knowledge and not a purely technical system which either works or not.

The notion of 'users' and 'consumers' were an inextricable part of the transactions which took place between the original project team and senior managers and funders. The former being convinced that there were indeed latent mass demands for interactive services, while the latter felt that only a trial could illustrate fully the technical potentials and credibility of the technology and concepts. Users featured strongly again when they became collateral in the transactions which took place between Om (and those responsible within Om for the trial) and potential PSPs.

Bounded with the notion of developing and learning core competencies needed for providing interactive content and services, PSPs invested in order to learn of the

organisational problems involved with trials and also to learn of what 'average' consumers would make of the system:

> "The presence of NOP (National Opinion Polls) on the Trial has facilitated the gathering of detailed user feedback. The initial data showing usage of services by Trial participants, along with their reactions to their experiences constitutes a goldmine of information for other companies wishing either to participate in other i-Tv Trials or to provide content or services . . . Indeed as such it allows the consortium to evaluate the revenue potential of such services for roll out in a wider context and even for eventual commercial deployment on a regional or national level." (Om promotional literature)

Identified as a crucial part of the learning process of the trial, was for firms to understand and gauge the impact of their individual presence on the system. As such the 'public' stage users (as opposed to the designer-users) were to a degree 'commodified', as user access and research was added as part of the value enticing companies to join the service nursery in the first place. Access to such information was unfortunately mediated by a dysfunctional group which was perhaps indicative of some of the deeper problems of information flows, management and governance

involved with the trial as a whole. Clearly, there was not enough effort (or probably resources) in building the sociotechnical constituency of the trial.

Chapter 8 – Conclusion

"It is not strictly civilisations that rise and fall but rather the ability of succeeding generations of people to live according to the inspiring ideals and laws of that civilisation. Surely the material artifacts are born and decay; the architecture, viaducts, irrigation schemes or even simple drinking vessels rise and fall in quality, effectiveness and beauty. The inspiration and dedication behind that skill, the coherence of that society, these are the determining factors, and these lay in the permanency of a canonic understanding . . . Canonic law is based on the objective fact that events and physical changes which are perpetual are nevertheless completely governed by intrinsic proportions, periodicities and measures. (Critchlow, 1981: cover note)

"Interactive TV will transform the way we manage our lives, the way we work, rest and play, the way businesses market and sell their services. It will change the rules forever."

http://www.ntl.co.uk/interactive-tv/default.asp (27/10/00)

Introduction

The much heralded 'age of network computing' raises some interesting issues for the Cambridge iTV Trial. As access to and use of the Internet becomes much more widespread than ever before, so the demand for bigger, better, brighter, faster and more dynamic services will grow. Content and service providers will want to respond to this demand by enhancing their services which are currently constrained to what the Internet can deliver.

This consumer and service provider 'pull' will really make the network operators have to take the subject of additional bandwidth provision very seriously indeed, particularly when coupled with demand for yet another potentially very bandwidth hungry interactive multimedia application - advertising. This is a big money business and some of the leading players are ready to commit to investing significantly in development.

These arguments are not difficult to justify; they are predicated on the simple fact that human nature dictates that no matter who we are or what business we work in, we always want better and more.

Where does this lead us? To fully interactive multimedia - including interactive TV. Full motion video, audio and complex graphics are all highly desirable elements of a truly interactive system. But why have such services not seen wider commercial deployment? You guessed it. The bandwidth cost argument. The stimulation of the demand for bandwidth on a variety of fronts will give the network operators a much more solid - and much needed - business case on which to base their network infrastructure upgrade strategy.

So what next for Acorn Online Media and its partners on the Cambridge interactive TV Trial? Keep an eye on developments. It's going to be exciting.

Phase Three of the Cambridge iTV Trial: The Network Computer[124]

A recent book based upon a conference celebrating 50 years of computing and the Golden Jubilee of the ACM - Association for Computing - features articles from major computing industry spokespersons. In *Beyond Calculation: The Next Fifty Years of Computing* (Denning and Metcalfe, 1997) are articles that focus upon technology, communication infrastructure, business and human-computer interfaces. What is remarkable within this volume is the reticence exhibited by authors to cast

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[124] http://www.acorn.co.uk/aom/trial/phase3.html (update as of 28th October, 1996). Unlike the written word, which when published and released to the public domain becomes 'carved in stone,' web-based information can be easily changed and updated. Information found at the same web address can change. This is the case here. The ephemeral and intangible nature of web sites and their contents pose a problem for studies which intend to include their contents as data. Whereas the so-called company 'grey' literature may count as tangible and veritable evidence for claims made by the company at some time, this is a much more difficult task with respect to digital and web-based material. This is not just a problem for academic research as Internet lawyer Anne Branscomb states:

> "The ease with which electronic impulses can be manipulated, modified and erased is hostile to a deliberate legal system that arose in an era of tangible things and relies on documentary evidence to validate transaction, incriminate miscreants, and affirm contractual relations" (Branscomb, 1997: p.113)

future scenarios. Rather the tendency is to speak on current or near future developments, or very tightly referring to 'sure bet' technological advances with reasonably clear 'path-dependencies'. Other chapters are revisionist, preferring to comment on the radical nature of developments in the previous 50 years.

The text which opens this chapter was taken from the Acorn Online Media web page at the time when the Cambridge Interactive Television Trial was drawing to its end in October 1996. As such it heralds the end of a particular period in the development of broadband interactive television in the UK, and indeed the world. At this time focus was shifting generally from broadband solutions to the Internet as a more immediate provider of digital services to the home. It also hints at a dignified compromise with respect to an overly ambitious technological project. The Cambridge system began with a large-scale vision that comprised of distinctive technological, institutional and social elements. This was a vision of radical change, impacting not only the way in which television content could be reconceptualised in terms of its format and delivery, but also regarding how people would access and use media and new kinds of online services within their everyday domestic routine. Principally, it would harness the new creative potentials of digital technology and networks to create an 'on-demand broadband network'. The technical potentials of this, with their 'inherent' commercial potentials, were viewed as both enormous and self-evident. The trial and its partners would spearhead the spawning of new content and services, they could lay rightful claim to the notion that they were 'cutting edge'. The trial was viewed as a series of three phases or steps towards a new kind of interactive mass market. This is a technology era where 'learning by doing' is a prerequisite.

But the digital era of business is volatile and dynamic. Changes in the landscape of regulation, standards and competition create exigencies that demand immediate appraisal, or change in strategy. How to respond to and prioritise change in complex webs of partner, client, and market demands, threatened plans, and forced directions. This was so true in the case of the Cambridge Trial.

Over the duration of the trial, technical and strategic directions shifted to accommodate more immediate business prospects in providing, from the system perspective, 'lower-tech' solutions. These would nevertheless utilise their STB technology and would let them meet their business plan projections for that year. At this same time they were faced with an overwhelming succession of costly technical problems to maintain and address the needs of the 'higher-tech' Cambridge system. Exasperating these problems were difficulties in recruiting trialists – those who were to act as surrogate users and consumers on the system.

There then came the promise of a very significant prospect of working with US giant Oracle to produce the reference designs for the much promoted 'thin client' or 'network computer'. The potentials involved in this offer had the effect of transforming the Cambridge Trial completely from its original functional aims and objectives. Originally, these *were not* to include access to the Internet as a sub-function of the system. The system that emerged at the end of the trial was one *whose only* function was TV-enabled Internet access. In some sense the technological ambitions of the original vision had regressed towards a much more manageable and prospectively more consumer-desirable and consumer-possible solution. The main reason for this is cited in the above quote as cost. In reality it was indeed a much richer range of factors which I have discussed at length in earlier chapters.

It can hardly be stressed enough that this thesis represents the product of unique window of opportunity. An academic researcher gaining access to the rich and pressurised contexts and processes of a commercially sensitive industrial event. The Cambridge Interactive Television Trial has come to be widely recognised as a prototypical example of the meshing of vision with the business, technical, human and social contingencies of the new media 'age'.

This was a project in which an entire technological system was developed and implemented for the purposes of learning *and* commercial interest. A trial is unique in that it is intended to directly interface technological development with semi-

naturalistic, real world contexts - people, homes, streets, and towns. The system and its characteristics, features and functionalities were appraised in terms of its operation, usefulness and usability (and other use dimensions) by those who designed and produced the technology, content, interfaces, and communications infrastructure, and eventually, those who were held as models of consumer-users - the trial participants. The success of this experiment remains open to interpretation.[125]

In this final chapter, I wish to recapitulate points from the various chapters, drawing them together to provide explanation of where I view that contexts of use make a pertinent contribution to theories of technical innovation and innovation of use. I wish also to make suggestions regarding the pragmatic potential of this in linking understanding of the use process relative to issues facing firms involved with producing new innovations. Particularly those such as TV-centric networked technologies and content destined for domestic locations and use. I place CU in relation to sociotechnical constituencies. The blending of the two perspectives I believe offers a way to bridge the gap between 'cultures of production' and 'cultures of use'. Contributing both to innovation theory, and to laying the grounds for developing a useful framework through which managers can map the contexts and environments of use to wider macro-level constraints, opportunities and influences.

Enlarging usability as a research project

One of the original projects of this work was to enlarge upon *usability as a desirable product quality*. To do so would attempt to accommodate the vast array of exigencies contributing to its realisation and evaluation - including the way in which an individual's experience of usability may change over time.

As indicated in chapter 4, usability engineering and testing as a research practice has traditionally been a lab-based activity, and as such, relied heavily upon controlled experimental methods and quantitative means of analysis. It has often combined

[125] While the intention of the Cambridge i-Tv being mass technology remained unfulfilled, innovation of the Om contribution - the STB - continued. The current generation is STB 4.

questionnaire administration, with system-logging and participant observation in order to evaluate time to completion of certain given tasks, where manipulation of certain interface elements provides an independent variable. The results of the test, combined with self-reports, and analysis of user behaviour during the test inform recommendations made to the product developers, regarding interactions on the original design. Dumas and Redish (1993) reiterate this when they claim that the; "specific instances that you see in a usability test are more often symptoms of broader and deeper global problems with both the product and the process." (p.32) In essence starting with standard usability lab-style tests highlighted within the present study that while the usability of the stand-alone demo box was 'good', a range of other issues surfaced in the interactions with subjects. These included issues regarding their thoughts and feelings about television, its content and the practise of viewing; their opinions about the content available on the demo box, what they *imagined* i-Tv to be and how this compared with what they were apprehending. This drove a need to approach the main study with a more open-ended style of approach, which would understand the usability of the system *in context* with an individual's perceptions and understandings.

Situating usability as company practice

This brings us to a second strand of development in the originally proposed Ph.D. study: That of - *situating usability as company practice.* This would consider usability testing, and its results as one of a number of competing knowledge flows within the real world, real time, pressurised product development process. Grudin (1991) noted that there are many influences which compromise usability programmes within product development in large organisations. He and others (such as Norman, 1993: Redish, 1989) suggest that management, 'traditional' development processes and organisational structure can hinder the incorporation of usability programmes. Indeed, such hindrance can be an ingrained aspect of company culture and routines. Redish and Selzer (1985) point out that two sets of costs which they described as 'test it now' or 'fix it later', may not come under the same budget with departments (i.e. R&D and customer service) battling it out for allocations. This causes a rift within

the organisation with respect to incorporating usability: "The manager who must get the manual to the printer on a certain schedule and within a certain slot is not responsible for whatever havoc the manual might cause later on." (p.51) Internal politics and power most definitely enter into the equation of how effective usability testing may be, and confuse and make complex any idea of usability delivering a linear result (i.e. a better and more usable product).

Understanding of such problems has driven the creation of usability departments *independent* of R&D and customer service departments. This ensures the place of usability within the organisation and its product development process, and helps in maintaining objectivity in the evaluation of a product's functionality. Usability becomes a discrete company function. However, Wixon and Comstock (1994) pointed out that testing often involved the setting of goals and tasks by the product development team, which were then used in tests by the usability team or department and who would subsequently return the user feedback to product developers.

While this is admirable in maintaining objectivity and scientific rigour in the application of the research - bearing in mind that developers and designers conducting tests themselves would often consciously or unconsciously influence results and their interpretations according to their own subjectified, sometimes impassioned view of the product. It does, however raise further questions regarding the successful organisational positioning of a usability study.

In the first instance, questions have been raised with respect to usability testing slowing down the product development process. Regarding the situated use of a product within naturalised settings, a number of usability experts (most notably Wixon *et al.*, 1990), began to consider the wider contexts of use, with particular regard to work environments. As I have argued in the thesis, usability (and the other use parameters) of domestic information and entertainment appliances depend on a much wider set of social and perceptual conditions than the relation between a product's functional qualities and human response time in performing set tasks.

Simply because a product merits the attribute of good usability by being tested in a scientifically rigorous way, this does not mean that it will perform that way in the marketplace (Wixon and Comstock, 1994). Also, while it may indeed add to the value and accessibility for the most amount of people's individual style and mode of use, it does not guarantee desirability and usefulness. Conversely, perhaps the least scientific and rigorous approach for companies deriving knowledge of their product in relation to perceived consumers - concept testing (i.e. Iuso, 1975) - is open to vast discrepancies between reported and actual product perceptions and consumer behaviours (Sands, 1980, Tauber, 1975, 1977, 1981).[126]

I wish to argue that there exists a rationalistically bounded perspective of the consumer-user by firms, largely created by the employment of various tools and research methods which filter and accent aspects of the user and their use process. Such filtration and accenting corresponds to the routine way in which the firm conducts its consumer-user research. It can also be in answer to changing corporate and industrial climates and philosophies where issues such as 'customer focus' and 'continuous improvement' (TQM, Kaizen, etc.) evolve in importance, or in response to tools, methods and procedures. These may rise and fall in popularity for enhancing, production, market success, and consumer satisfaction (usability engineering, QFD etc.)

I am not alone in adopting such a focus. *Macroergonomics* (Hendrick, 1991, 1995) is a more recent contribution making a concerted effort to place the ergonomics of machines and interfaces at the centre of a more holistic, integrated and systemic view of development. It is a top-down approach to system design based on a sociotechnical system perspective. Macroergonomics focuses on the optimisation of work system design through consideration of relevant personnel, technological, and environmental

[126] "Concept tests and product tests do not work . . .The limitations of concept and product tests as predictors of subsequent sales are borne out by empirical investigations and literature surveys . . . Furthermore, they are generally of value only in the case of continuous products where consumers are well aware of standard attributes and functions; for discontinuous innovations they are unlikely even to predict trial." (Tauber, 1981: p.182)

variables and their interactions. Hendrick (1995) further defines macroergonomics as the "third generation" of ergonomics, where the first generation was characterised by *human/machine* interface technology, and the second generation by *user/interface* technology. The goal of macroergonomics is a fully harmonised work system at both the macro-and micro-ergonomic levels.

Again, while macroergonomics may work to place usability as a relevant quality within the social and technical settings of the workplace, there remains questions regarding the *experiential qualities* of usability. This relates much more strongly to the processes of everyday consumption and integration of technical products into lives and lifestyles, into the private and personal space of the home. Indeed, one could argue that one can expect to use [sometimes complicated] machines in the workplace, whereas the legacy left from domestic machines and technologies – light switch, vacuum cleaner, electric clock, fridge, television – is one of simplicity in operation. Silverstone's notion of 'domestication' - which along with the notion of the everyday practices and consciousness has formed a recurrent theme in this thesis, and it suggests the more personalised, possession-style rituals associated with learning to use and live with ever more complex technologies (PCs, hi-fi separates, home cinema – all of which require some degree of installation).

Recontextualising

In all cases there exists practices which permit managers, designers and marketers to augment (and authenticate) their reflexive notions of what is happening outwith the world of the workplace. A central view of the thesis is that usability, as a research project conducted by firms, should be *recontextualised* into design-producer's worldviews as a *naturalised* part of the overall use process.

This would shift its emphasis from being an index of how assessable and usable a technology is with respect to the intentionality of the designer or producer, to the experiential qualities of use from the consumer-user's perspective. This entails a process of understanding the designer-producers intentionality, as much as

understanding the user consumer's interpretation of the product , and therefore of that intentionality. Design and use is a dialogic process, as is production and consumption. Under this rubric of 'naturalised' I wish to include the fact that the product of such studies - the knowledge produced by the research - must locate within the company at its most useful points, with those who may best use it to inform strategy and influence design and marketing. Further it must communicate ecologically the data which are relevant in order to be effective in the implementation of design features, functionality and attributes.

However, what often stands in the way of this, and what was clearly evident in the case presented in the thesis, is that the methods of understanding use and users constitute an identifiable and bounded system of social interaction between the firms involved (as well as their partners in alliances) and its consumer-users (or trialists). Arguably this is intermediated by other 'cultures,' such as those comprising du Gay's *et al's* 'cultural circuit', but also within 'sub-cultures' at the intra-firm level, say, between departments and functions. In the case of this study, the PSPs featured strongly as one of these 'cultures'. The company itself effectively forms a social sub-culture within the wider context of the parent culture of the society within which the company operates. They, and their products, also form spheres of negotiation between various individuals and company cultures, a process which can lead to contested, negotiated, ineffective, and erroneous reifications of use and the user.

This process leads inevitably to the creation of 'cultural distance' between the users of a system, and those who would analyse or design it. It is this notion of a cultural 'distance' which provides the motivation for employment of techniques and ideas from outside disciplines, those particularly concerned with appreciating and understanding the variations in meaning and concepts between different cultures - interpretative approaches ethnography, naturalistic inquiry or hermeneutics for example. The product of consumer-user research has often been validated only by the criterion that it is implemented - and therefore considered to be ultimately interpretable - by managers (as Holbrook, 1995 puts it 'managerially relevant'), and

useful to the processes of invoking strategies and policy, making decisions and reducing risk. But there is a place to inform designers and marketers directly, to engage them to understand tacit elements of use and usage.

Beginning with the actual consumer-user and their complex of behaviours, attitudes etc., the first stage of reification is appropriating or conducting research. The process of selecting research reports, commissioning a study, or setting one up is based on elements such as a client's or manager's brief, reflexive considerations of the problem, training and knowledge of the field (which includes knowledge of methodology, tools, previous research and so on). There then follows further stages of reification, through processes of presentation, distribution, negotiation and re-interpretation before knowledge of the user and use is embodied in the product manifesting as particular characteristics, features and functionalities (see below).

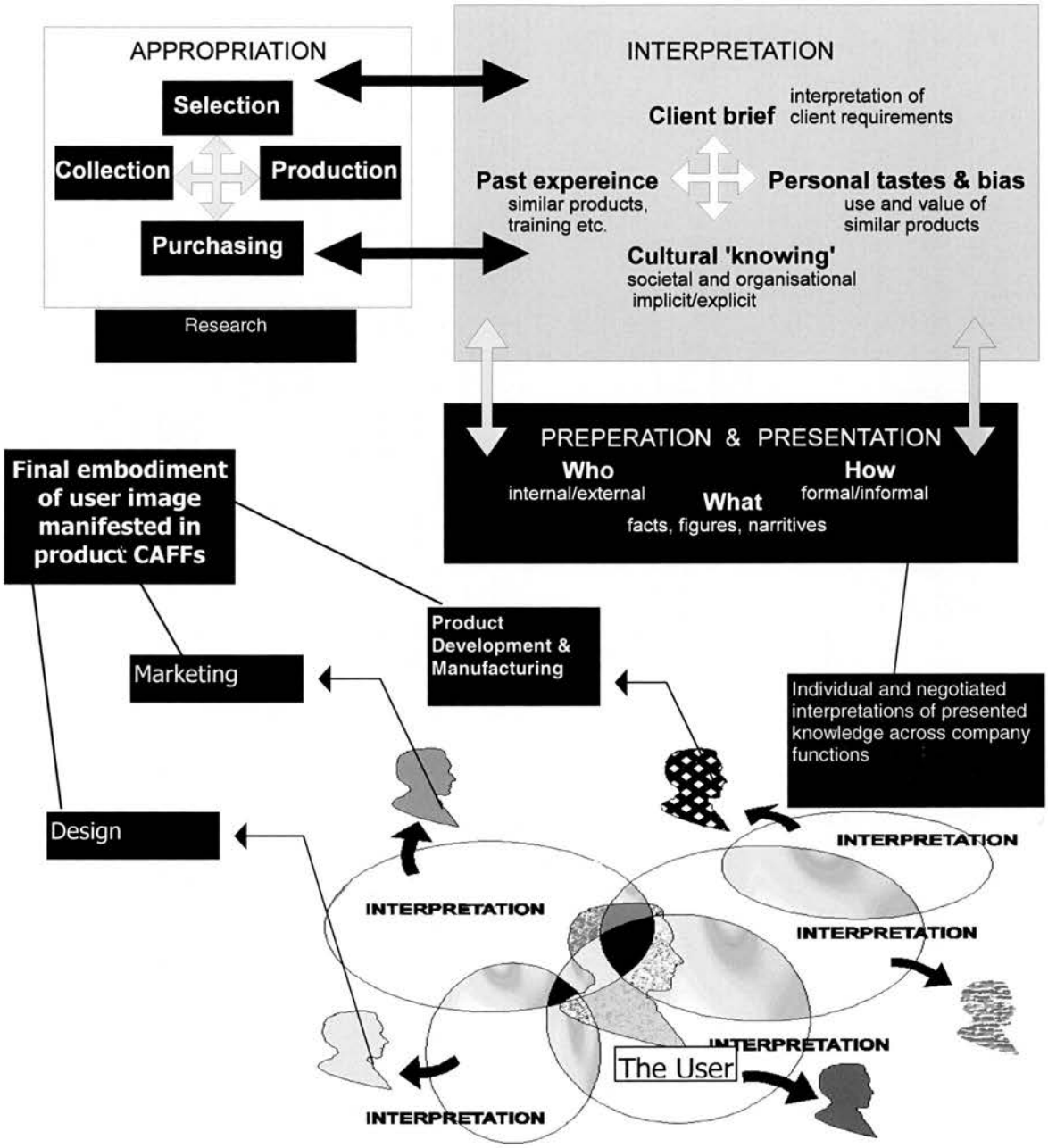

Fig 8.1 Research and its interpretation as provider and filter of knowledge of the user-consumer

Impact of discourse on technology development and perceptions

In chapter 1, I have suggested that anticipation of technologies, and their potentials extend further than situated and actualised circumstances of use. The discourse that accompanies technologies can influence perceptions of whether they are a 'good' or a 'bad' thing for society, or even regarding personal use and consumption or even

whether they are worth participating in a trial.[127]

For instance, the moral panic that suggests that through using computer-based technologies to communicate we mitigate our need to have person-to-person interactions, can carry weight in the shaping of markets.[128] As TV-centric technologies permit on-line shopping and ordering of goods the less incentive there is to go to the shops or to the video store to rent videos. Television-using time is displaced with games console playing time. The amount of people that it is possible to 'meet' online rises, while the quality of the interactions are often diminished or taken out of their human context. Sobchack (1996) suggests the intertextuality of expectations between domestic technologies. In a world socialised into timeshifting and speed of process, our expectations rise with respect to performance, transferring such expectations onto other technologies - she offers an example of the child who suggests that her mother 'fast-forwards' the 'slow' microwave.

In my own pilot study there seemed to be consensus in the more 'middle-class' households regarding that 'use' of printed material provided a superior, more 'reputable' source of entertainment and information over the use of television. This was echoed in one of the case studies (case study 5) where the parents had strict household codes with respect to television use. How much is such an attitude influenced by the recurrent theme of 'video violence' which appears regularly in the headlines of newspapers? How much are they reinforced by the formidable support from research that claims that the viewing of violent material propagates violent feelings and behaviour in individuals? How does such discourse and attitudes impact diffusion? In which way do they, and in which way can they, restrict and otherwise shape consumption and use? These questions, while outside the scope of the present study, remain of interest to the notion of how discourse shapes perception of television and its programming.

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[127]Phase two trial participants were to comprise employees of the technology partners. However, the 'rumour' that spread regarding the lack of the Cambridge system to deliver useful content, was understood to have played a significant role in the subsequent lack of interest shown by consortium members to participate in the trial.

[128] Indeed I was consulted during a visit to Om regarding the 'video violence' debate in its potential

In the first two chapters, I made the suggestion that many of the new and emerging digital technologies, such as those whose primary feature is making television interactive, suffer from a kind of 'interpretative flexibility' or 'descriptive confusion'.[129] Coming under the auspices of interactive television, enhanced television, augmented television and various other rubrics, digital technologies intended to bring online interactive services to the home have different meanings to different people - they are polysemic - their interpretation depends on the interests, intentions, and knowledge of their user-consumer-audiences.

Interaction **while capable of being decomposed and described in both technical and content terms, nevertheless does not necessarily relate to the user experience. It is as polysemic (perhaps to an even more pronounced degree) than content material taken as an individual component of an overall experience of use. Interaction, with 'interactive' media, like social 'interaction', is for the large part tacit compared to the experience or outcome of searching for, finding and viewing content. It is rather like the 'journey' to some 'destination'. Someone may ask you how your trip was, but it is unlikely that they will ask how the steering on the car handled, unless they had some vested interest - such as the car being their own. But this is the case in design evaluation where one seeks out what may appear sometimes very subtle details regarding the use and user experience. Attempts are made to unpack what is, in effect a 'whole' experience which may include characteristics of the interface, the content information, graphical design, ease of use, the brand associations with advertised goods, delivery and fulfilment, and cost. All combine to deliver value or *usefulness*.**

User innovation

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spill over to i-Tv.

[129] 'Descriptive confusion' was originally identified as an issue which Bricken (1991: p.4) applied to virtual reality (VR):

> "VR is seeking definition, it could be anything from email to a fully surrounding, multi-sensory environment. We are struggling with appropriate comparisons."

This public domain comprises of not only those who will consume and use technology but also those who will innovate upon them and innovate upon their use. Coming from the social constructivist perspective on technology development, Westrum (1991: p.238) suggests that: "A device may appear to be something different to different groups interested in exploiting it . . . it may evolve in quite different directions." Further, as understood by the *cultural circuit*, *actor-networks* and *sociotechnical constituencies*, the 'public domain' also includes those who will regulate technologies as well as create legislation regarding their production and use. To capture how users and others may reinterpret use and meaning in technologies can have significant implications for designers and producers (Von Hippel, 1990, 1996; Fleck, 1994). Also, most importantly, the public includes creators and producers of other, often related technologies which create the conditions and environments (such as competition, cheaper network access, and so on) whereby the new technologies flourish. All come to experience the product, interact with it, in different ways within different frames of reference.

As much as usability exists only as a single element within the human comprehension and experience of technology (along with situational circumstances of use, the development of usage patterns, and development of value and usefulness), its importance and meaning to the firm only finds place or makes sense within broader business, social, institutional, ideological and cultural frameworks. It is reasonably safe to say that the rise in the awareness of usability and *user-centred* design as a contributing factor in the success of products and services, parallels the movements in management practice towards more *customer-orientated* approaches (Wiklund, 1994). Under such management climates any tool or set of techniques that promise greater customer satisfaction may be incorporated into product/service development processes (for instance, Walsh *et al.* 1997).

However, this intersubjective creation of the consumer-user by a firm and its partners, distilled through research and presentation processes, is only an element which informs design and marketing of a product as only part of complex. Design is

never free as it is always constrained by influences beyond the tools, knowledge and thinking that enable it. It must always conform and meet, but yet must also extend. It is a fundamental and constant human activity, entailing far more than has been suggested by limited definitions of design as the optimal use of available resources or as some sort of index of aesthetic merit. Cooper and Press (1995) suggest that the contemporary nature of design as a process and practice is indeed ambiguous:

> "Design can be conceived from being an individual activity such as designing a chair, through to a corporate planning process that regulates innovation to meet market demands." (p.42)

So one may *design* technologies, one may *design* an organisational structure, services, research, an interface, or even *design* for experience.[130] Each of these design facets and challenges are to be identified within the Cambridge Trial. It has to be finally combined with other influences into the design process (such as costs, recognition of standards and so on). I shall return to this aspect in greater detail later where I suggest the relation of CU to wider constituencies of social and technical influences. Here I wish to suggest that it is the mode and inquiry and the mode of explanation of the basic research which defines and colours the initial 'virtualisation' of the consumer-user in the process (above and beyond the initial reflexive notions held by the product instigators).

Traditionally, as in large-scale market surveys this takes the form of aggregation statistics of some sort, providing some insight into 'generic' consumer-user preferences. This data may be combined with psychographics or other complementary studies which lead to some notion of a 'preferred reading' of the consumer-user favourable or perhaps dismissive of some suggested strategic move regarding new product development (see below).

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[130] More than the obvious design of the physical and graphical interfaces, the architectural layout of the offices, desks and meeting rooms of the new Online Media (Om – the firm whose serves as central focus in the case study presented later) HQ was designated by the Acorn Chief Scientist. Between her 'usual' work in advanced chip set design for the first and second set top boxes (which pre-empted all other development work), she occupied herself in designing the layout of space and personnel. Om also laid down the organisational design and structure for the entire trial, even though as a consortium activity 'ownership' of the trial was often dependent on which partner one asked (for instance Cambridge Cable publicity suggested the trial as their own). Also most noticeable on visits to the building was the succession of make-shift charts adorning the walls.

Table 8.1 Data, information and knowledge regarding the use process

	use	usability	usage	usefulness
Subjective/ objective	Can be fairly objective	Objective	Objective/ subjective	Subjective
Subjective	Motivation or attraction to use, circumstances and location of use, service/s chosen	Experience of use	Time to complete task, satisfy curiosity, or achieve entertainment satisfaction	Value outside of immediate use, gratification,
Objective	Who, where, what, and why	How easy to use/understand	What, when, and how much	What, how much, and how long
Research methods	System tracking participant observation, self-report through quest. survey, interview, diary methods, etc.	Usability inspection methods, usability testing, etc., beta testing	System tracking, participant observation, self-report through questionnaires/ interviews	Self-report, possibly triangulated with use and usage data
Spatio/ temporal	In shop, in home, at work, in school□	Immediate term short term long term	Patterns of use□time spent on tasks/programme□	Period of valued use; immediate term short term long term Relation to extra-use activities
Attribute, Phenomena or task	Demo-psycho graphics of user, individual differences of user, genre of service, style of presentation, awareness of product and its technological contexts, knowledge of point of sale/ Demonstration location	Ease of navigation, short cuts, ergonomics of physical interface, screen and menu layout	Which service watched, for how long, level of interaction, 'zapping' between services, which times watched, regularity of programme/ service use	Value of services to individual, the sustenance of value, perceived from actual value, symbolic value.
Characteristics	Individual characteristics, Technology itself (interface, delivery platform, system)place and context of use	Design and characteristics of the hardware and software interface, experiential characteristics of the system	Individuals position in the household	How it compares with perceived options
Domain	Psycho-sociological, psycho-economical, geographical, psychological	Techno-psychological	Psycho-sociological	Cultural, psycho-economical

As suggested from the introduction of this thesis onwards, the incorporation of

interpretative paradigm research, coupled to enhanced means by which to extract behavioural data from consumer transactions with systems, alter the previous horizons through which designers, marketers and mangers may authenticate their perceptions of their product, its use and its consumer-users. It opens previously constrained spaces of use knowledge (i.e. domestic activities).

The product and marketing reaches into the public domain in general and specific ways, dependent on distribution and advertising, press reports and so on. Diffusion of the product into people's lives, and subsequent research begins the process again for the innovation of other products (fig 2 below).

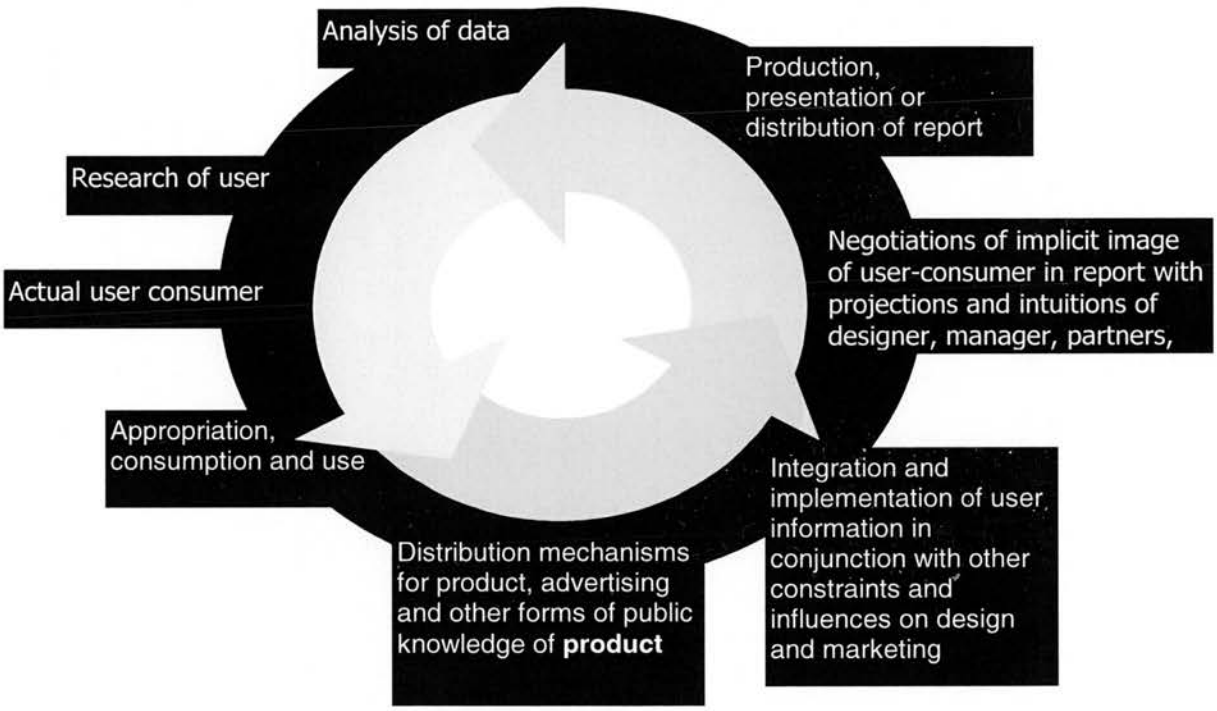

Fig. 8.2 A circular model of user knowledge propagation, communication and implementation

The procedure of the above model has been broached by a number of industrial changes, most notably the incorporation of user-consumer-product 'tools' methods or techniques, developed in answer to the call for concurrent modes of manufacturing, higher degrees of agility and faster times to market for products, advertising as point

of sale in digital interfaces, and one-to-one manufacturing or mass customisation.[131]

Within the thesis one of the main points which I have drawn attention to is that the above circular model is threatened by a number of changes. These include:

- **Changes in the ontology of audiences, users and consumers.**
- **Changes in consumer tastes and rational regarding goods and services.**
- **Changes in the transactional technologies linking providers of goods, media content and services to users-consumers.**
- **Wider changes to the business environment resulting from the direct or indirect digitisation of business and economics.**

As with other cultural products and their creation, dependent on wider societal shifts in emphasis and interest, research methods in disciplines such as psychology have evolved to ask new questions, asked and answered in new ways." (Smith *et al.*, 1995: p.1) Also within the business world, analysts are increasingly dissatisfied with using simple aggregated market statistics that reveal little about the underlying sociocultural dynamics that affect acceptance of advanced technical systems (i.e. Gonzalez, 1997).

However, as explored earlier, according to the objectivist, neo-positivist or hypothetico-deductive view, authentic knowledge is acquired when the "subjective" - emotional, aesthetic, moral, and religious - elements in knowing are strictly and rigorously eliminated. Such elements, it is held, taint or distort knowing and the derivative knowledge by introducing elements of ambiguity and commitment. A large part of the project in what has come to be regarded as the 'dominant' view in research method has been to eliminate extraneous influences from the object of the research other than those introduced or known by the researcher. If not isolated, these 'extra-scientific', subjective elements would determine the foundational paradigm

[131] An *agile* company has been defined by Goldman *et al.* (1995) as one that is capable of operating profitably in a competitive environment of continually, and unpredictably, changing customer opportunities.

upon which science is erected and leave science in the realm of opinion and 'rationalised superstition' (Gergan, 1973).

In the standard view, it becomes the purpose of a rigorous scientific method to insure that knowledge is obtained by 'objective' and 'verifiable' means. The ultimate object is attaining knowledge of the particular features or functions of the object of study, and to infer causes and predict effects. In the grading of levels of knowledge according to their degree of objectivity, knowledge is most certain that which has the smallest amount of personal contamination. Mathematics and physics would be pure sciences in this view - while knowledge is most problematic where the personal element is greatest - arts, literature, philosophy, as well as in those 'complex' sciences such as biology or psychology, and moreover in the social sciences. These, however are also the domains often most associated with the propagation of culture, and shape the values and meanings people have for things in the world.

With its roots in the natural sciences, where properties are deemed to lend themselves more to measurement and control, positivist approaches have been exposed to a number of critiques (i.e. in psychology in the early 70s with Gergen, 1973; Harré and Secord, 1972; and Shotter, 1975). Commentators manifested discontent with positivist method, and the exclusive dominance of quantification. Harré and Secord (1972) for instance were concerned with the mechanistic model of human beings which academic psychology seemed to subscribe to. These were derived, as was suggested in chapter 4, from the rise of behaviourism as the regnant force in psychology.[132] The popularity of behaviourism and 'big project' sociology, and other disciplines such as anthropometrics and ergonomics (described in chapter 3), co-evolved with the massification of industry, the mass media, and urbanisation. It provided answers to a society increasingly reliant on science to solve problems

[132] The rise of behaviourist thinking has been linked socio-culturally to the urbanisation and industrialisation of America. Bakan (1966) sees that these social developments created motivations towards mastery of the 'incomprehensible and worrisome strangers all around us' - exactly what the scientific claims of behaviourism promised to help us do. Indeed studies and literature promoting 'new paradigm' research have often appeared critical and defensive when confronting the 'conservative' and 'domineering' stance of quantitative 'hegemony'. Quantitative method is often viewed as the 'received view' Collican (1990).

derived from vast changes in lifestyle and living conditions. But commentators on consumption (e.g. Firat *et al.*, 1995) view reversal in the roles of production and consumption as a distinguishing feature of recent society. Production loses its privileged status in culture to consumption, which has become the means by which individuals define their self-images for themselves as well as others. This clearly illustrates the sovereignty of the consumer in processes of selection, use and re-use, which will impact directly or indirectly upon production.

But the design of technologies are often optimised in various ways according to intended or 'aimed use' within the specific environments of factory, workshop, office, kitchen, living room, garden etc. They form an integral part of the multiple flows and networks of activities and energies which constitute and sustain the space we call 'home' and most importantly, its relevance to everyday life and activity. But also in the case of technologies, and as was the example in the story related by Akiko Busch in *Geography of Home*, it is often only when technologies breakdown that they, their use, and their function, comes to conscious awareness and focus.[133] Then, and often only then, do we realise their relevance and integral nature in sustaining the smooth running of domestic affairs. Most relevant to the story is the way in which addressing breakdown led to reconceptualisation - a taking stock of the contexts or the 'bigger picture'. Busch reflects on her tale of her faulty septic tank pump thus:

> "While I reject categorically the idea that my house (or any other) has a personality, I have come to realize that it does have a language of its own, one that includes not only the slight sounds, hums, and vibrations of all electrical appliances that keep it going, but a host of other interior systems, a network of social and cultural currents, those habits, beliefs, and values that also make it function. And I realize, too, that it is by being attuned to all these systems that we might arrive at some genuine understanding of what it is that gives us power to the places we live." (Busch, 1999: p.163)

She alludes here to the home as a seething, living complex of elements and dynamic flows, as an exchange of energies and industry. As such she hints at how the home,

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[133] I have already mentioned Winograd and Flores (1986) citing of Heidegger's when he speaks of *breakdown* to represent this phenomena. This is a bringing to consciousness awareness things, objects and thoughts through their 'lack of fit' or 'lack of flow' in the course of purposeful use is an important concept to the functioning, as well as evaluation of technologies.

the domestic, its contents, activities and technologies represent a whole, a dynamic open system, and a special case for study. While her example hints at an animistic view of the home, the home considered as a living entity, she does not promote a blurring between human and non-human elements (as is promoted in actor-networks). Instead she shows how they fuse. Mesh in a *meaningful* way, which lead to an enriched view of the environment in where she lived. But Henri Lefebvre (1992) warns against taking such kinds of metaphors too seriously lest one abstracts too much from properly comprehending the lived experience of things:

> "Consider a house, and a street, for example. The house has six storeys and an air of stability about it. One might see it as the epitome of immovability, with its concrete and its stark, cold and rigid outlines . . . Now a critical analysis would doubtless destroy the appearance of solidity of this house, stripping it, as it were, of its concrete walls, which are glorified screens, and uncovering a very different picture . . . permeated from every direction by streams of energy which run in and out of it by every imaginable route: water, gas, electricity, telephone lines, radio and television signals, and so on. Its range of immobility would then be replaced by an image of a complex of mobilities, a nexus of in and out conduits . . . the occupants of the house perceive, receive and manipulate the energies which house itself consumes on a massive scale. Comparable observations, of course, might be made apropos of the whole street, a network of ducts constituting a structure, having a global form, fulfilling functions, and so on . . . The error – or illusion – generated here consists in the fact that, when social space is placed beyond our range of vision in this way, its practical character vanishes and it is transformed in philosophical fashion into a kind of absolute. In face of this fetishized abstraction, 'users' spontaneously turn themselves, their presence, their 'lived experience' and their bodies into abstractions too." (pp.92-93)

As a tools of analysis, sociotechnical constituencies and actor-network theory attempt to protray why a technology 'is as it is' at a certain period within its development cycle, how it reached this stage, and how it relies on some understanding of where its origins lie, from both its technological and social contexts and origins. But they too speak in metaphors, as do those who speak of the acceptance and domestication of products. But as Ulrich Neisser indicated in *Cognition and reality* (1976) we do not perceive things in themselves – i.e. pure stimulus - but the meaning things have for us. Meanings are attributed to things by a range of individuals and institutions, and so they are conditioned by a complex of influences including the symbolic attributes of the product group (i.e. the status attributed to certain models of cars or watches).

These symbolic elements are afforded sense through the propagation of myths - utopian or dystopian discourses, marketing and PR, and moral panics (via marketing and/or press reports). These always accompany products in their diffusion through to consumption and use. Further, there are the tensions and resolutions regarding how these are situated within the pre-existing networks of social and technical relations and use functions within the household, as well as lives, lifestyles and everyday practices of potential consumer-users.

Mechanistic models of people

Mechanistic models of people - as individuals or groups - arose with the enlightenment and the development of neo-positivist ways of conceiving of the human and the social. It culminated in the rise of mass systems of media, and production fuelled notions of 'the' subject, 'the' user, 'the' consumer, and 'the' audience. There are dubious epistemological assumptions implicit in these maxims - there is a lot more to the story than 'coming to know X', where X is a generalised, stereotyped user, consumer or member of the audience. They are often taken to be 'cybernetic' beings where particular inputs will produce certain outcomes. Such images of the user or customer base have long been popular in HCI, usability, television ratings, and the selling and buying of goods and services. It is generally assumed that knowing the user, audience or consumer consists in developing familiarity with the prospective consumer-user's task domain. This is achieved through modelling it in some way, providing the designer, programme scheduler and marketer with a handy (usually quantitative or measured) characterisation from which requirements can be derived and needs identified.

As far as techniques in HCI have been concerned, this is far from the end of the story. New schools of practice and thought are adding new dimensions to this idea: one of these is *participatory design* - otherwise known as the 'Scandinavian Approach'. Although this method is considered to have drawbacks resulting from the introduction of users into the design process - the added complication of extra human relations to manage, possibly taxing the social skills of the design team; the risk of

'group-think', and so forth - the benefits which can accrue as a result of more closely integrating the users and their knowledge of their environment are such that the approach has increasing legislative force supporting its use.

'Creating the user' considers how the notion and role of 'user', 'consumer', viewer, subscriber, subject, customer collapse in the light of new media development. The user, within the course of initial product development has been for the large part little more than an 'unknown other', someone who will take into their lives and home a technology which they will find benefit and value in using. Market success used to be the main illustration of demand for certain product classes. However, in the more post-modern marketplace much more radical innovations have perplexed quality processes such as quality function deployment (QFD) in their efforts to align the 'voice of the customer' with the 'ear of the engineer'.

Quite clearly, images of the 'research subject', the 'user' and their use process, and the 'consumer' may be constructed through the projections of researchers, designers and managers, where they attribute behaviours and attitudes onto their users based on their own lifeworld experiences.

They may also be based on more formalised renditions of how people are based on scientific, marketing, usability and consumer research. With respect to research Poole and McPhee (1985) see that;

> " . . . it is easy for researchers to impose their own constructs and models on subjects, substituting observers' insights for actors' processes and understandings. The substitution often occurs unaware, because researchers take social scientific constructs for granted and do not consider that they only reflect professional discourse and not the reality of subjects . . . for example is the way we conceptualise relational control consistent with how subjects see control issues? Are the statements we call dominant actually seen as such by subjects? Are subjects even concerned with control in day-to-day interaction?" (p.130)

This draws attention to another point of focus regarding the circular model of user-knowledge-implementation referred to earlier. The intersubjective creation of the

consumer-user by a firm and its partners, distilled through research and presentation processes, is only a single element informing design and marketing of a product. It has to be finally combined with other influences into the design process (such as costs, recognition of standards and so on). I shall return to this aspect in greater detail later. Here I wish to suggest that it is the mode and inquiry and the mode of explanation of the basic research which defines and colours the initial 'virtualisation' of the consumer-user.

People's lives, lifestyles, language and system-logging

Language lies at the very heart of interpretivism - interpretation is a quintessentially linguistic phenomenon. Interpretivism, as contrasted with rationalism, may be characterised by an awareness that nothing comes to us an as absolute 'given'.[134] Understanding and awareness occur against a much wider background. Such processes invariably comprise of a gamut of communication techniques and styles and symbolic manipulation. The casual chats, the more targeted and practised sales pitch, the various marketing and consumer research practices each are acts of communication which develop learning and knowledge. Rogers (1983) identified *diffusion* through the process by which: " . . . an innovation is communicated through certain channels over time among the members of a social system." (p. 5) John Law, Michele Callon (i.e. Callon, 1980, 1986; Bijker and Law, 1992; Latour, 1987), and others such as Doheny-Farina (1992) have also drawn distinct attention to the way in which rhetoric plays an integral part in technology development. There is a particular power in this proposition when one considers the instance of 'high-tech' products such as consumer electronics. Here, there is often heavy reliance upon pronounced claims of improved or superior technical performance and/or specifications.[135] The

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[134] In as much as rationalism is taken to imply the notion of a priori truths. It could be claimed that the obvious "contrast" to such a stance is (by definition) empiricism.

[135] Consider the placards and stickers upon devices on retail shop shelves. There is often an exhaustive list of features and specifications labelled on a device. A particular example is the configuration of PCs. It is widely held that the ever more impressive graphics features of computer games are largely responsible for driving the development, and a matching consumer need, for the enhanced video features of graphics cards. Adding enhanced components to a system can often highlight a more general core weaknesses in the overall system's performance. In this example, this can lay the grounds for the need of other enhanced components, or indeed an entirely new machine.

high-tech digital age builds upon a manifest desire on behalf of *both* industry and consumers for things to be made smaller, more powerful, faster, louder etc., and for these specifications and features to be made to be public knowledge (i.e. publicising specifications for the purposes of attracting buyers, or conspicuous exposure of high-tech possessions).[136]

For the large part, drawing upon thinking derived from social studies of technology I propose 'interaction' to be a point of convergence where different sets of exigencies converge and exchange. Between various social groups, between the needs, requirements and goals of individuals, and the characteristics, attributes, features, and functionalities of products.[137] For instance how close is the fit between something that is created to be useful but also for profit? What is the difference in the industry of design and the industry of use? Something that is *found* to be useful but also valued?

Some social perspectives take the position that technologies in general are "neutral", which means basically that they are seen as "value content free" (Feenberg, 1991: p.6) neither good or bad in themselves but which may be used well or badly depending upon who controls them. Thus, according to Arnold Pacey, who supports this idea, when technology fails or when it has negative consequences, the cause is not the technology but the improper use of it by: "politicians, the military, big business, and others." (Pacey, 1992: p.2) The relevance of such positions may have validity upon policy-making levels, but they tend to act towards a neglect of technological impacts, and more importantly the co-shaping that constitutes successful diffusion – something which is not institutional, but ultimately individual

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[136] However this is also a time when products are arriving in the high street *unfinished*. Whereas it has become common practise to realise beta versions of software commercially, using consumers to indicate via help-desks flaws in the software version – hardware devices are now appearing for sale which show functional discrepancies with the claims made in the sales literature.

[137] I take for the large part the problem proposed by Marzini (1990: p.70); and quoted in Cava and Svanfeldt, 1992: p.308) when he speaks of the problem of existing market research to identify issues of new products:

> "A market study . . . can only photograph reality, bringing forward what is, in a way, already obvious. It cannot show the detail, the meeting point between what the general public might want (but has yet to find a way of expressing it) and what the producers might offer (but have not yet found an expressional support for) and what constitutes the idea of new product."

(Miller, 1995).

For instance there are no 'general-purpose' tools. Technologies have specific features which do not pre-ordain, but certainly predicate, certain uses. Technologies are intrinsically biased towards characteristics, features, and functions. Technology interacts with other factors (for instance economics, political views, etc.) in a system, shaping attributes and being shaped by them. Technologies may have influences on us at macro-, meso- and microsocial levels.

This feature of interpretivism may well account for the popularity of continental existential philosophy in Information Systems literature and research, in particular that of Martin Heidegger (who in turn, tutored Hans-Georg Gadamer, often considered the father of modern Hermeneutics). Wittgenstein in turn could perhaps be characterised as interested in the nature of that background; the nature of the rules and conventions which allow us to interact with one another, and the world about us.

Commentators on science method such as Polanyi (1958) argued that there is an inescapable and essential personal element that is a structural component of all knowledge whether the case be physics, biology, medicine, painting, or poetry. This is the essence of phenomenological method where the emphasis is upon understanding the 'building blocks' by which the individual constructs meaning. The social dimension of knowing is retained in our references to the "scientific community" or "academic community." Essentially, knowledge is thus not private but social. Socially conveyed knowledge blends with the experience of reality of the individual. This is an important issue regarding the development of use skills by individuals, as well as how technologies integrate into everyday life (domestication).

However, as indicated in chapter 4, interpretative research is not an answer in itself to understanding the nature and behaviours of the interactive user-consumer. Polanyi (1966) demonstrated we can know more than we can say. This is a problem for those whose research approaches rely on eliciting responses form people regarding tacit

behaviours and routines. For instance, Ehn (1988); Bullen and Bennett, (1990); and more recently Grudin, (1994) with respect to CSCW systems, show that tacit knowledge continues to play a disturbingly large role in many of the problems designers struggle with. In my own user research I noted that some people are more able to articulate their activities than others, or are perhaps more vocal and opinionated regarding what media, and in particular, what television means to them. Some people seem naturally more introspective and/or articulate regarding their thoughts, beliefs and opinions on things. This too can shape and direct responses.

This places an emphasis on awareness, tools, methods and procedures which can balance feedback from *all* types of individuals, so as not to predicate the design and advertising of systems towards those more vocal, or able to articulate and express their beliefs and experiences.

In the case studies of trial participants, one household (appendix 1: Case Study 2) could be tagged with being non-articulate regarding their impressions and thoughts of the i-Tv system. However, on closer analysis of pre-existing use and usage of media technologies (such as timeshifting using the VCR) they were most definitely among the more sophisticated users. This may be compared with another household (appendix 1: Case study 5) which could be labelled more articulate and expressive, whilst remaining among those households who exercised strict rules and regulations regarding media use and consumption (i.e. electronic media was rated as inferior to printed media, and the childrens' viewing was precisely monitored and restricted).

This relationship between interpretivist practices, language, and more contemporary phenomenology is also worthy of note. Phenomenology is, ostensibly at least, concerned with the experiences which individuals have of the world about them, and language has found an increasingly important role in understanding the connections between the embodied individual, social interaction, and the wider experiential world.[138]

[138] Particularly in the work of Maurice Merleau-Ponty. It would also be interesting to explore the

Tacit behaviours are of relevance and of interest to marketers and in chapter 5, I drew attention to the potentials that interactive media have in tracking user-consumer's actual (as opposed to realised and perceived) usage patterns. While the quantitative analysis of audience viewing patterns (the 'ratings') - based on projections of aggregated audience viewing behaviours - have long reigned as the essential tools of broadcast companies, media buyers and advertisers in their courting of clients, they have been criticised for presenting poor representations of 'true' audience activities (i.e. Ang, 1991). In my own user research it was clear that people were using the television for different purposes including baby sitting, recording programmes for viewing later, or for playing video games. However, digital systems have an inherent by-product of their functioning in that they can register every control signal produced in their use. Such system-logging (sys-log) data can be associated with a particular machine (STB or computer), or with the provision of an access code a particular individual.

However, as the case study of the Cambridge Trial indicated, the preference for technical and numerate means of understanding use and user, led to a plethora of problems, social, organisational and technical in nature regarding the production of appropriate and usable knowledge. On a more general level, the essential problems facing those interested in trawling the large volumes of data produced by electronic use logging data is precisely that which challenged the veracity of the television audience ratings (Ang, 1990).

What can truly be inferred by number crunching and aggregation statistics alone, when acts of consumption and participation in entertainment activities are quintessentially meaning-making and highly qualitatively based experiences? These are experiences often participated in for intrinsic motivation rather than for rationally economic outcomes.

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connections between his rejection of the idea of the pure / private consciousness (Blackburn) and view of the role of society and language, Wittgenstein's anti-private language argument etc., Maturana's biological explanation of linguistic phenomena, and the recurring notion in Information Systems work

In between, the 'hard' neo-positivist research approach of lab based usability testing, and the 'soft' qualitative research of concept testing lies trials. Here trial participants - acting as surrogate consumer-users - develop anticipations and visions of the product based on the concrete features and functionalities of actual systems. Combinations of research approaches, such as was attempted by the user/marketing research group of the service nursery can produce valuable insights which can fuel technology and service design and production, as well as inform the best ways in which these technologies and services can be marketed and packaged. A number of marketing innovations including the distribution of demos (such as the success of shareware versions of games like *Doom* in selling the full versions) and beta testing, illustrate the interest of firms in the naturalised siting and testing of their products. Experience of, *and living with*, a product is essential to either seeding markets for improved expanded versions, or other associated spin-off.

This is in keeping with a number of movements now being understood and adopted by the large corporations with respect to a more holistic view of how people are with technologies they already have integrated into their every lives, and how they come to confront and cope with new ones.

In engineering there has been the attempt to bring to focus some of the more ephemeral, less tangible qualities of a product such as discerning the 'voice of the consumer' in QFD. Here, quite diffuse, subjective and qualitative aspects of a given product are supposedly infused into the design and manufacturing process through a ranking system. This converts them into quantitative measures suitable for choosing materials, setting machine parameters and so forth. However, even here one can see that the qualitative voice of the consumer-user only functions as an initial and relatively minor influence within the processes of conversion. Emphasis of the deployment concentrates on the conversion of design parameters to engineering parameters, and then subsequently to manufacturing and production parameters.

(see Winograd and Flores, 1987).

Also, the capture of the subjective data may be flawed:

> "[QFD] . . . has to be used in a careful and methodical way. You cannot just let the customer say the window handle in a car should be easy to wind. You have to find out just what that means, in the number of turns, the stiffness of the handle, the reach. You construct carefully a matrix of the characteristics of a product and mesh that with a analysis of the customers needs and keep turning the data, like a prism, seeking new flashes of insight in to what the customer wants." (Main, 1994: p.96)

This is an important point that suggests the well-cited software industry adage – GIGO – garbage in- garbage out. If one begins a deployment with badly articulated or sampled user needs and requirements then it will lead to a poor product. An obvious instance where this may be caused by the product, rather than the research method, is in the case of new types of product (like i-Tv). The lack of being able to reference new kinds of characteristics, attributes, features and functionalists to existing products may provide useless data. Main (1994) points out that QFD can contribute to incremental improvements in products, but it has not been linked to breakthroughs in new products.

Summary

Much of the recent work in consumer research, studies of the audience, or in contextual HCI work complements and fills a gap when considered aside the emerging capabilities of digital networks and technologies to provide complete registration of their use. But it is important to consider two main interconnected points relevant to an overall – or *whole* - picture consumer-user research:

> **1. The sphere of research methods is constantly evolving.**
> **2. As a pretext and also as a result of 1., the scope, depth and sphere of imaging uses, consumers and users are also changing.**

Academics and others concerned with methodology have drawn awareness to the fact that the process and procedures of research, can and do omit aspects of use and consumption integral to the 'actual' or 'real' experiences of people. Sys-log in some respects develops from previous quantitative – and to an extent mechanistic - approaches in human research such as questionnaires, surveys, and participant

observation.[139] The ethnographic and interpretist style studies deny mechanistic positions even in their approach to 'subjects'. Rather then viewing them as 'knowledge or information providers' they are viewed as 'co-researchers' in the design, research and development process.

'Virtual' renditions of use and consumption activity always impact upon marketing and design activities. They have also - perhaps more insidiously - influenced policy decisions shaping the overall culture and modes of governance of a country or state (such is the basic case of Miller, 1995 when he critiques the privileged position of economics in influencing government policies). Virtual renditions of use and consumption created by model making - in the case of economics the 'rational decision making activity of the consumer - could be said to be evolving a different model which takes into account the sense-making activity of individuals towards goods and services. The emphasis here is on the developing awareness of the experiential aspects of the product. The Japanese preference for experiential approaches to market testing, for instance, has often been cited as a cultural disdain for market research. Experiential approaches to understanding the consumer and the use process also features as the underlying epistemology of beta testing software and technology and marketing trials.[140]

It is widely accepted that the creation of working images of use and the user, have played an important role in product development, whether as products of formal or semi-formal research projects, or as reifications of reflexive projections on behalf or mangers, designers and marketers. These working images of use and users are imbue, inscribe or otherwise shape the product in concert with a complex of other influences - purely technical potentials and constraints; standardisation and regulatory issues; and further manifestations of the firm's desire to promote its identity and public

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[139] It should be mentioned that these techniques also have their online correlates, and can provide powerful means by which user feedback can be automatically processed by the system to provide analysis and graphical or numerical renderings of data.

[140] It should be mentioned that, as in the case of the Cambridge Trial, trialing systems promote opportunities much wider than only the provision of semi-naturalistic environments for discovering participant perceptions. They offer the opportunity to test out how the technical and social components 'fit', and draw attention to problems of organisation, technology, and implementation.

image (such as design specifications supporting branding and the look and feel of the product etc., see below).

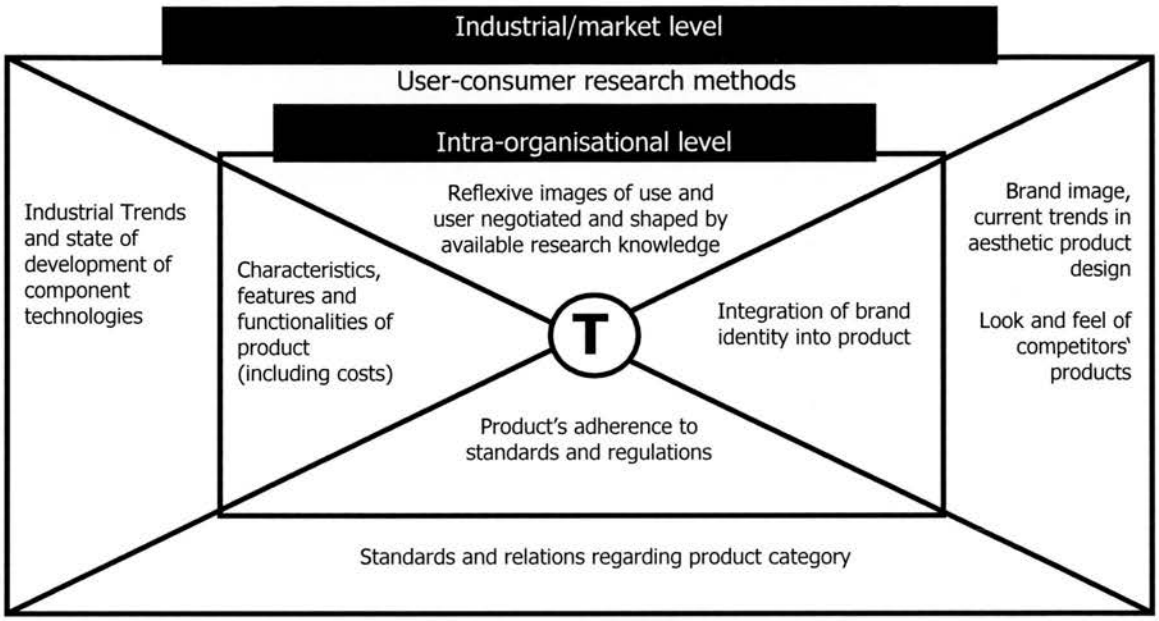

Fig. 8.3 Summary of influences on product design and development ("T" represents a central focus upon technology) (After Molina, 1987)

Technical standards represent codified knowledge that may easily be applied to product technical and functional specifications. They also can provide 'hard' evidence of impacts to the firm in terms of complexity and costs. However, the impact of user knowledge and the disparity of use and user images in the processes of feature and functionality design represent much less tangible elements. However, a price has been calculated regarding bad usability (Nielsen, 1993). And added to this is the potentials for total failure of the product in the market place, hold ups in the product development process, and outstanding costs incurred through help desk inquiries and product replacements.

The ingredients included in the circular model of user knowledge propagation, communication and implementation, and the model presented above provide a static picture to what is essentially a temporally dynamic process socially and over the process of product development. This suggests the natural polarisation existing between the maturity of a product or system, and the need for user input to the

design. Also, the state of development of a new product or system can serve as an index to relative knowledge integration. In a review of the product development literature, de Bont (1992) differentiates five consecutive phases in product development process: strategic, idea generation, idea/concept formalisation, product development and market introduction. In each phase, specific consumer information can be used to optimise the process and reduce the risk of wrong decision. A radical innovation may, depending on the nature of the technology or service, require more or less consumer-user involvement in any co-design process to guide development or provide a sense of security regarding market potentials (see table 8.2 below). This may have been, but was in fact not, implemented on the Cambridge Trial.

Table 8.2 Consumer information useful across the different phases of the product development process, and the research methods that may help to acquire it.

Phases in the product development process	Consumer information required	Consumer research methods	Information and knowledge to be developed
Strategic Phase	Market description in terms of perceived competitive products and their consumer evaluation	Gap-analysis	Awareness of market opportunity – information such as size, level of competition, profits and market-company fit (Urban *et al.*, 1987) Unfulfilled consumer-user 'needs'
Idea generation	Ideas that combine with internal strengths of the company with market opportunities	Consumer-based Idea generation Need assessment	'listening to the voice' of the consumer-user brainstorming in company assessing the intensity of needs
Idea, concept Screen and evaluation	Acceptance of ideas or concepts (functions)' evaluations of several combinations of attributes	Concept testing	Information which links the new product idea with internal strength of the firm with a market opportunity Concept testing with consumers
Product development/product evaluation	Acceptance of product	Product testing	Development of a prototype, evaluation tests with consumers
Market introduction	Market-entry strategy	Market testing	Marketing tests prior to introduction Assessing the new product in real-life market environments

The state of development of a product can also provide some metric of what knowledge is required by whom (in the organisation) at various periods across the

development process. The concurrent developments of product design, production and manufacture, with marketing can cut time to market, and fulfil the desire for agile approaches so favoured in post-Fordist manufacturing. It is clear that a process which integrates all aspects of design, production and marketing and which integrates the user in all aspects of this activity will produce products which minimise risks regarding place and profile within the market.

This draws to attention the wider contexts of the dynamic forces of social and cultural change, design, innovation and evolution of business practice.

- **The nature of business is changing.**
- **The nature of consumption and accessing goods and services are changing.**
- **Standards are created and evolve, sometimes independent of market diffusion.**
- **Technologies and their complementarities evolve within systems of production and cultures of use.**

It is within these various contexts that CU may be envisaged as making a contribution in an applied sense. It does so in its view of consumer-user research benefiting from approaches which promote the recontextualisation of the use process of the product as a ***situated*** act both within the *cultures of production* and within *cultures of use*. It addresses the parsing of the organisational needs for consumer-user knowledge with the state of development of the technology, and the evolving needs and perceptions of the user-consumer. The table overleaf outlines some of the research questions which can form a CU study.

Table 8.3 showing general research questions arising from the interaction of use, usability, usage and usefulness

	use	usability	usage	usefulness
use	What is a users overall impression of the technology in each situation and circumstance of use?	*Does the technology adapt to cater for the increasingly sophisticated user?*	Does the use of the technology mainly fall into functional, exploratory, or recreational usage patterns?	By which channel has the consumer been informed of the technology and drawn to use?
usability	Is the system easy to access and use on the initial attempt?	What are users overall impressions of the usability of the technology initially and over time as they develop familiarity or expertise in using?	How are usage patterns affected by the usability of the technology?	*Are usability problems made transparent by the perceived and actualised usefulness and value of the technology?*
usage	Which aspects of the technology are most time spent upon in initial use? Subsequent uses?	Does usability deter the formation of usage patterns?	Can users initially perceive periodic use of the technology integrated into their current activities? How does this vary in reality? □	Does usefulness become 'transparent' through continued use?
usefulness	Which aspects service appear most useful on initial confrontation with the system?	Is usefulness of value of the technology negated /attenuated through good/bad usability?	*How does the formation of usage patterns relate to the perceived usefulness of the system?*	What are users overall impressions of the usefulness and value of the system over time?

Drawing the salient points together

For the remainder of this chapter, I wish to surmise the main points as raised within the thesis. I shall put forward a tentative model of how studies of the user and the use process may map with the various components influencing product development may be integrated which accounts for a wider scheme of organisational and socio-cultural influences.

There are two particularly important social factors to be taken into consideration in

the design and use of new media such as TV-centric networked technologies. First, as previously explored, the workplace constitutes an identifiable and bounded system of social interaction, something which places *cultural distance* between the users of a system, and those who would analyse or design it. This is a gap which interpretivist research methods hope to promote awareness of, and eventually, perhaps indirectly, bridge. This suggests the two way research focus demanded in such a bridging study - one is understanding the nature of the organisation and individuals who comprise it, and matching this with appropriate levels and types of knowledge from the site, field and sub-cultures of use.

To begin to understand how users of a system and the system itself will interact, one must understand the social elements within the aforementioned bounded social system. Such a bounded system existed in the Cambridge Trial, which included elements which were technical such as the technology and the content material of the trial, as well as participant's televisions, hi-fis and so on; and elements which were human and social in nature - the company personnel, technology and content partners, the service nursery and its various sub-groupings, the participants, their families, friends etc.

The key to such understanding lies in understanding language, and more specifically, the nature of language use. It is in language, the primary basis for interaction between discrete individuals, that cultural and social patterns are manifest, and upon which they depend. Language is in turn entirely dependent on social interaction within the wider setting of the world.

The presence of commonalties in terms of conceptual and cultural background between users and designers, or at least an awareness thereof, raises the possibility of design which takes genuine and unbiased account of users' social context - the particular sub-culture within which they inhabit. Such a task becomes immediately more plausible once the notion of interaction between effectively disparate and incommensurate conceptual schemes, as tends to be implicit in ethnological

approaches, is tempered by an appreciation of common ground. With the support of a coherent interpretivist semantic theory, one can then hope to make explicit the sort of action one needs to take to achieve such an unbiased understanding of users, or what it is that one must *know* about users - that which is silently embedded in participatory design, and other 'soft-systems' style approaches. Any cultural entity is changed when viewed from a different cultural context.

Cultures of use

The focus of the thesis has concentrated on media technologies, which as mediums, maintain particular features and funcationalities that expand upon, and even challenge, the notion of use as it is used with respect to tools and other artefacts. Use is a divided notion when considering media technologies. It can refer to the artefact itself - television, hi-fi, telephone and so on - or it can refer to the sense-making activities involved with its content consumption, viewing, reading, speaking, listening. Use here refers to the value involved in transacting with systems, software or other people via - or mediated - by technology. In many cases electronically mediated experiences seamlessly incorporate with all other forms of experience - whether communicative, informative or relaxing, simulating, enjoyable or even frightening, disgusting, and/or fun.

The development and subsequent use of a new technology is quite obviously involves innovating upon both technology as well as practices. Initially when the technology - such as an internet STB - enters the home the first experience of use can be awkward. However, if the manual is well written, and or if mode of use is self-explanatory the experiential aspects of its content becomes the object of focus. This stage represents the initial site where formulations are made regarding potential usage patterns and registering the usefulness of the technology and its contents. This may be marked by the finding and subsequent bookmarking of several particular web sites of interest, sites which indicate some form of updating suggesting beneficial accessing on a regular basis. Usage is also accessing sites on particular days at particular hours.

The use process as described in this example correlates strongly with Silverstone's notion of domestication further elaborated upon by commentators on technology such as Sørensen (1993). Domestication is the process of sublimation by which artefacts and technologies incorporate within everyday life, experiences and activities. I wish to suggest that the anticipation and actualisation - by consumer-users and designer-producers - of the use process is the mechanism of domestication. It is a process that begins with the genesis of the original design (from a shared universe of possibilities), through ideation, to actualisation, iteration, prototyping, testing and diffusion.

New media innovations and their use, both enable and displace, expand and contract, amplify and reduce experience. While not being produced in a social and technical vacuum (as they are reliant on various interest groups and other technologies for their components and their manufacture), they likewise do not enter a vacuum when they reach the home. They must accommodate within the existing regimes of technologies and their functions, social practices and individual consumer-users perceptions of the world. Technologically, in the case of television centric technologies this means most notably the television. Where this is situated within the household, what the household constitution is, the various rules of household governance etc. each play an interactive part in fashioning attitudes towards the new technology as well as instigating and shaping patterns of use (see fig 8.4 below).

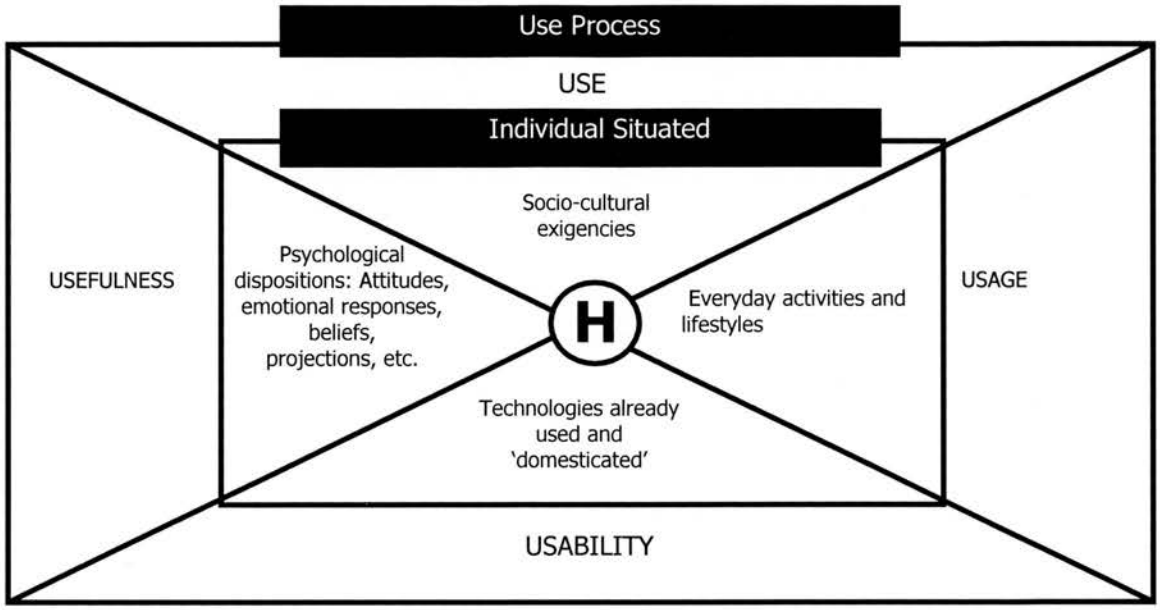

Fig. 8.4 The influences on the domestication process ("H" places the central focus on the home, or rather a given individual's perception of the home)

Technologies that work together represent a particular product class. PCs must connect to printers, television sets to hi-fis, and in the 'smart home' the continued diffusion of 'jelly beans' - the industry definition of non-computer resident microprocessors - suggests the range of connected or networked artefacts will rise exponentially.[141]

However, Baudrillard's (1988: p.31) suggestion of the consumer caught up in "a calculus of objects" in the act of viewing goods within a shopping mall, the same is true for the technologies and objects which we live with. Much has been written regarding the symbolic attributes of television and other media technologies (for instance, Silverstone and Hirsch, 1992; Silverstone, 1994), however there is little which addresses the way in which existing technologies, or existing domestic technological constituencies impact upon adoption (and interpretation) of the new. This is quite clearly an open area for investigation, which can be extended to investigation of how adaptation leading towards new use practice, feeds back, impacts and otherwise redefines existing practices and instances of use, usage, and

[141] There is estimated that there is something in the region of 6 billion chips existing in various artefacts and technologies. The suggestion is that we are moving from 'crunching' to 'connecting'

perceptions of usefulness.

Cultures of production

As in large technological systems (such as suggested in the analysis of commentators such as Hughes, 1986), the success of the technology such as Edison's electric mains relied on sympathetic consideration for the systemic qualities of each individual component or technology. Brands are the symbolic correlates of technologies that indicate to the consumer the potential that technologies will be compatible in look and functionality. And standards (in networked multimedia such as DAVIC, and DVB which attempt to ensure cross compatibility between platforms, in quality ISO 9000, and in CE marking which indicates that a product complies with harmonised EU requirements for safety and health).

The use process as described in this example correlates strongly with Silverstone's notion of domestication further elaborated by commentators on technology such as Sørensen (1993). Domestication is the process of sublimation by which artefacts and technologies incorporate within everyday life, experiences and activities. I wish to suggest that the anticipation and actualisation - by consumer-users and designer-producers - of the use process is the mechanism of domestication. It is a process that begins with the genesis of the original design (from a shared universe of possibilities), through ideation, to actualisation, iteration, prototyping, testing and diffusion.

Raising the profile of the individual in sociotechnical constituencies

Much of the work on sociotechnical models has tended to concentrate on analysis and evaluation of large industrial processes. Molina's sociotechnical constituencies for instance has been applied to transputers and the transputer-based parallel computers (Molina, 1990); and European IT programmes and initiatives Molina (1992, 1994). However, in a later paper (Molina, 1997) learning from the user was

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Kelly (1997).

incorporated into the constituency building process of a mobile computing device by applying the contextual usability framework.

The underlying thinking here is that some commentators have drawn attention to the fact that many technologies manifest as *configurations* of previous artefacts, developments, knowledge or expertise. Clipson (1995) views this process indicative of an essentially techno-centric situation of "technology building on technology, where progress is not a random affair but a synthesis of what went on before." (p.103) A prime example of such a technology may be the Om STB - most definitely a configuration of previous developments, knowledge or expertise, and it these configurations which largely dictated the immediate strategies for design, and visions of the potential markets. However if one considers technologies from their use perspectives, one would be mistaken to say that the STB was simply a re-invention of the RISC PC. In a technological sense it was much more than the sum of its parts, and its was at this point where much more social and cultural elements fuelled visions and business orientations.

The sociotechnical model posited by the Tavistock Institute has been based on the manufacturing process and also at the lowest level of organisation (Heller, 1989). Even tools such as QFD can be criticised as offering only a token involvement of consumer-users at the very earliest stage of development, most of the process is based on translation of design, production and manufacturing measures. On the basis of this such models may come under the criticism that they are inherently technologically orientated, or techno-centric.

Molina has explicitly privileged technology in the constituencies model by often placing it as the central focus of the constituency. Such a position has an interpretation that it itself has created and manifested all the conditions which surround it, that it is the 'navel' of all the other elements. This compares with other models in studies of technology such as actor-network theory (for instance Callon, *et al.,* 1986; Law, 1992) where the emphasis is to balance consideration of social

relations of individual human actors with non-human, non-individual entities – a more distributed view with multiple foci of analysis and importance in a study. While this can contribute to a consideration of a development process considered as a whole system, it puts pressure on the researcher or analyst using this method to attach proper weightings to the component elements (cognitive, social or technical).

In sociotechnical constituencies the dynamism of the social relations is anchored very strongly to the state of development in the technology, as if this development was all that motivated and created inertias. He sees that technologies are indeed social creations but argues that "many of these social creations evolve characteristics which tend to remain stable for long periods of time" (Molina, 1997). He sees that these stabilised characteristics have "critical implications for specific strategies of innovation and development of technological capabilities." (p.1) This denies instances of the dynamic relations between people and technology, where the technology may remain stabilised in characteristic, feature and functions, but where it is attributed with a varying cultural importance which can impact usage and usefulness.

While it is true that technologies do appear to maintain certain characteristics for some time - such as in the case of the television, where basic functionality and make up has remained relatively stable since the development and wide diffusion of the EMI system - it is also interesting to note that human and cultural conceptions of the television have gone through considerable change and evolution. Also, the content and technological means to production has radically changed, as has the cultural and social perspectives that inform programme-making and presentation.

One of the artefacts of this co-evolution or mutual-shaping process is the notion of domestication, the way in which artefacts integrate within the practices and everyday life of consumer-users. This process has also been suggested as a kind of 'co-consumption' - technologies are consumed by users, and users are consumed by

technologies - in so far as technologies "get our attention, have us react to them and to become occupied by their abilities, functions and forms." (Sørensen, 1993: p.157)

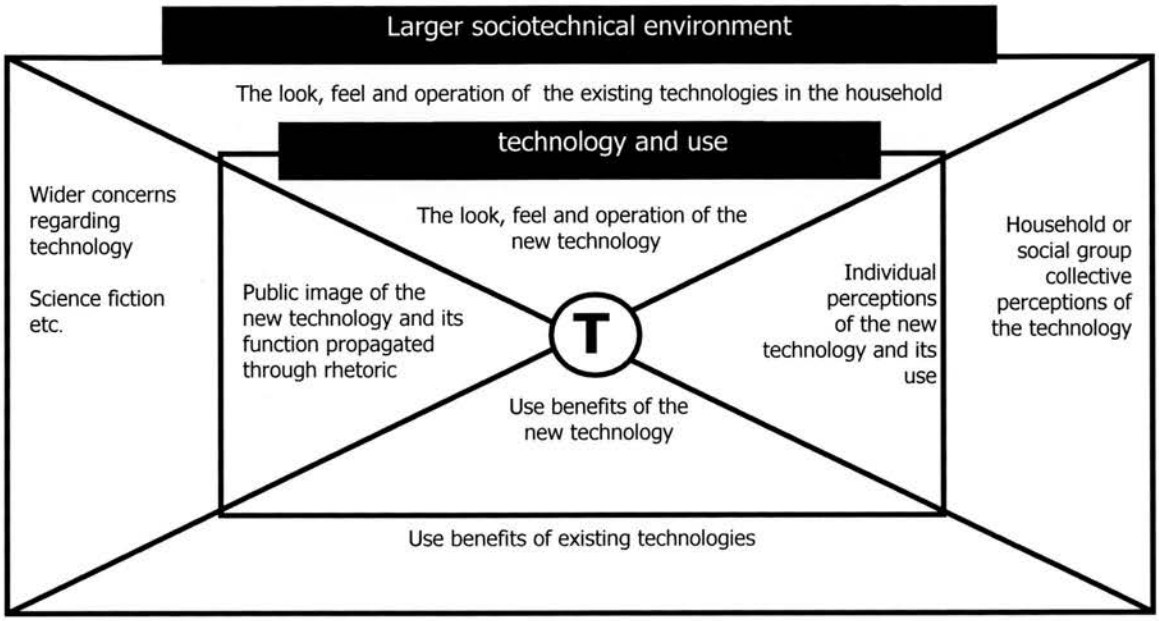

Fig. 8.5 The sociotechnical constituency of domesticating technology

Within this process certain uses emerge for these technologies, certain features and functionalities are of use. Conversely, certain uses are not available, convenient, permitted, easily accomplished, or affordable, and it is these instances which characterise and accent resistance towards domestication, the patterning of use (usage). These draw awareness to the technology's capabilities and limitations. Providing the technology's designers and producers can capture and realise these situated and actualised instances of use they can develop iterations on the design which may be able to open areas of the technologies potential which may otherwise lay dormant or a mystery to the users.

As I have endeavoured to detail in the preceding chapters, there has been a very significant development in the way in which the act of using television has evolved. By placing the human being - the user, consumer, reader, viewer, audience member, research subject etc. - at the centre of a constituency, we can relocate research perspectives or technical, economic, institutional and legislative changes relative to

the individual or individual group of consumer-users.

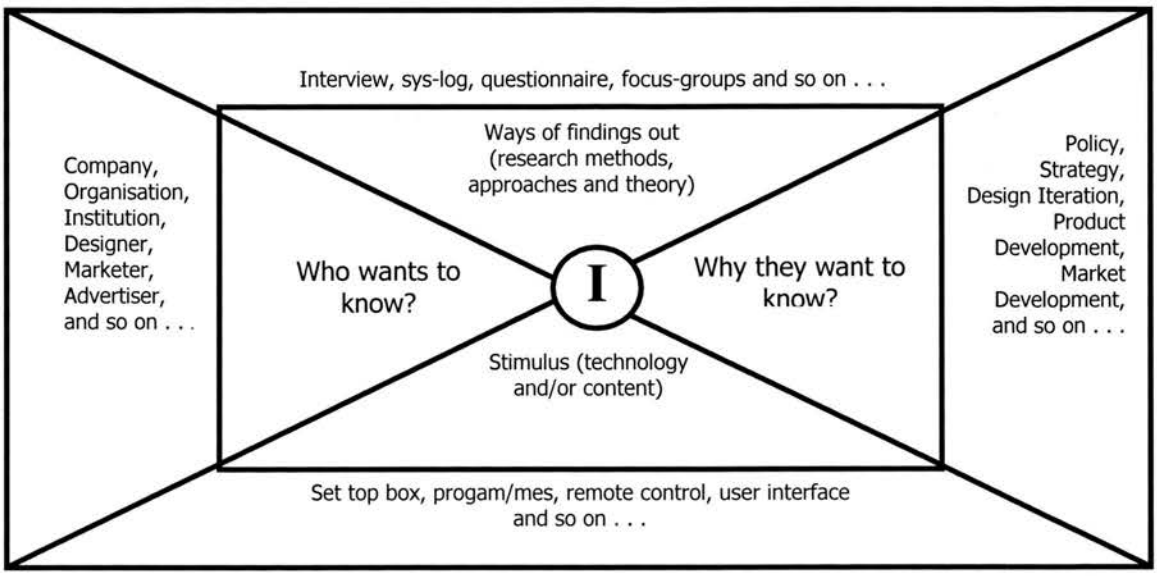

Fig. 8.6 A human centred sociotechnical constituency ("I" is for the individual, their perceptions, apprehensions etc.)

As in sociotechnical constituencies which place technology at the centre of the constituency, the above model places the individual human being at the centre of the constituency - be they user, consumer, viewer, reader, research subject - known, constructed or identified by any other title, category or label. This draws attention to the way in which their image, virtual self or 'alter existence' is socially and semiotically constructed by different companies, organisation and institutions or by certain individuals. Further, it is a route by which the way in which such 'institutionalised images' may constrict, impact and otherwise affect research processes, and indeed policy and strategy regarding product development and design. Such as was the case in the Cambridge Trial outlined in chapter 6.

The 'individual' and the notion of 'society' are constructs which have formed the substance of study by social science. Various schools of thought have implicitly or explicitly advocated different epistemological and ontological positions which have characterised and polarised the notions of the social and individual over the last 100 or so years. These positions have also been reflected within disciplines manifesting

as rifts between the use of certain methods over others. These rifts have obfuscated the value of social science method when applied to 'real world' commercial situations of evaluation, where matters of 'correct' methods and their implementation are relegated under pressures for 'easy fixes', rapid development cycles and/or 'lust of result'.

The reasons why organisations wish to develop knowledge of people are multifarious depended on their business and development strategies. What they can learn is dependent on the state of the stimulus - technology or content - presented to them in the form of prototype or mock-up. Prototyping has many similarities except the prototype system is built and evaluated in order to construct a detailed specification for the full system. It is further dependent on the method, approach and theories involved in the research process - themselves contingent on time, resources and access.

Instances here include the perennial debate between purist psychological perspective of the world, compared with purist sociological viewpoints, and the difference between quantitative and qualitative research approaches. Heller sees that they were aware of the bias that may appear in its development of the Tavistock sociotechnical model:

> "Although the [sociotechnical] model was developed by social scientists, it does not attempt to preference the social component. Human requirements cannot be maximised without damaging the potential technological contribution in most cases. Usually, both have to be suboptimised in various degrees, depending on the contingencies of the situation, in order to achieve an overall optimum." (ibid)

Westrum (1991: p.13) provides several alternatives through which technologies and societies may parse;

> " . . . a thing must fit its purpose . . . We can change the society to make it more adequate to cope with the technology; we can refuse to deploy technologies which our current social institutions can't handle; we can try to develop new sociotechnical systems that *jointly optimise technology and the human factor*; or we can simply let the system go on as it is now and suffer at some future time the consequences of a serious mismatch between complex

> technologies and the adequacy of our social institutions to handle them." (ibid.; p.13)

Such a focus is at the centre of the recent interpretative approaches to researching audiences as well as the impact of media messages. Such approaches have been profitably employed in usability studies of computers and consumer durables, where the sociological contexts of use are increasingly understood to be as determinate to framing the use process as making product easy to use.

> " . . . just as it is important that technologies are designed for their users, it is just as important to realize that users may have very different reactions to them . . . Linking the skill of the user to the technology is the task of social institutions." (ibid.; p.231)

More recent work at Edinburgh (Project Newspad) has witnessed a preliminary attempt to locate CU within the frame of the sociotechnical (Nicoll, 1995; Molina and Nicoll, 1996; Molina, 1999). The practical benefits of such a fusion opens the potential of linking appreciation of consumer-user perceptions of a technology as a distinct element placed against other influences to the design process. As products become more 'smart', as customised manufacturing approaches develop, or 'on-demand' entertainment, information and delivery services become the norm in the home-based consumption, consumer-user intelligence, user-producer co-design and organisational development must become integral if not absolutely imperative. Araya (1995: p.237) suggests that : "in the name of "enhancing the world" the proposals for Ubiquitous Computing constitute *an attempt at a violent technological penetration of the everyday life*." (Author's italics)

This must include facilitating, understanding and evaluating the ***whole range*** of emerging ***interactive relationships*** that are enabled and constrained by new forms of feedback via technological systems. This is in stark contrast to previous design, manufacturing and marketing research practices, as it includes the interactive relations not only between people and goods, people and organisations, but people and the systems itself, and the emerging technological and organisational environment. For instance, selectivity and choice on behalf of the user further shape

the technological environment:

> " . . . when someone buys an already built house, its design reflects the actions of the builder and the house's previous owners. The longer a person has the house, the more its contours, colors, furnishings, and general physical condition reflect the owners characteristics. And then there is the basic fact that the owner *chose* the house in the first place. We could go a step further by suggesting that the nature of the eventual home now shaped the technology in the first place; put another way, the technology was designed for its intended users." (Westrum, 1991: pp.172-173)

The ultimate goal of such a project balances the natural leanings of technology companies towards a techno-centric view of use, usability and usefulness, with one that is focused on the situations of consumption and use of their products. Conversely, it creates possibilities of indexing ecological approaches to developing consumer-user intelligence indexed to the stages of product development.

Such an approach keeps in mind the notion of the sociotechnical as posited by the Tavistock Institute. It represents a means of analysis of both the particular socio-technical contingencies of use within the wider universe of discrete and obvious influences arising from the constituency in which a technology is created and developed.

Heller argued that in order to effectively balance both the social and technical elements of constituency in order to produce appropriate recommendations, policy or advice there had to be some elements of research: "In nearly all cases of some complexity, it needs research to discover the appropriate contribution of the two components." (p.24) The suggestion for a pragmatic application of CU and sociotechnical constituencies suggests, like in evaluation studies, a two-way reflexive research approach where a firm, its organisation, practices, inertia and background are taken into account before embarking on a process of consumer-user research. This would give a clearer perspective on which information, would be most beneficial, for whom and why.

It would appear then that CU as an applied consumer-user research approach, would benefit from being placed against the wider constituency of what motivates, shapes and otherwise influences product development and design. Essentially, this translates as a mapping of user research as a singular element into the constitution of the features and functionalities of a product. Looked at as a symmetrical relation we can consider the producer-consumer, designer-user, product-lifestyle relationship thus;

Table 8.4 The elements linking production, design, and product with consumers, users, and their lifestyles

PRODUCER	branding, advertising; other products in product range similar and related products in market place	well known, reputability, symbolism where, when, what type and quality	**CONSUMER**
DESIGNER	product features and characteristics functionality product aesthetics	usefulness to current activities, potential novel use niches usability, desirability	**USER**
PRODUCT	functional relation to pre-existing use of similar products; cost relationship to consumption of similar products; Symbolic attribution of possessing product.	how easy to access news between platforms; price of news between say internet services, and watching TV; status through having, or being able to use, being able to show etc.	**USER-LIFESTYLE**

The tensions inherent in the above pivot around the creation (or 'encoding' to use Hall's model) of characteristic feature and functionalities, and their interpretation (or decoding) by the user-consumer. The manifestation of this interpretative or decoding process is the use process, which I will suggest is a central mechanism to Silverstone's notion of the domestication of technologies.

I would further suggest that the use process lies between the two distinct constituencies of the contingencies of design and production (as well as distribution) and the contingencies of use- the technology-centred constituency and the human centred constituency. Consumer-user research as traditionally practised falls between these constituencies and is intended to provide the company and its personnel with useful perspectives of the user-consumer. User-consumers on the other hand exist in

a world which consists of many activities, pursuits, and interests outside of use and consumption of particular technologies. Worlds which comprise also of many other technologies, which may be competing for attention, and which have elicited their own impact on the use process of any other technologies entering into the arena of lifestyle and the living space (see overleaf).

Between these two constituencies, which are constantly evolving (although quite clearly with different dynamics) there exists a tension best envisaged by the needs and requirements (or the capacity for needs and requirements) for improved features and functionalities upon what they already have, do, want and use. While some of these needs and requirements may be tangible (i.e. faster, smaller, more power etc.) some may be difficult to identify lacking a common currency in description (such as peoples interest in ever increasingly more convincing cinematic special effects). The dynamic qualities of the model dictate that no phenomena or product is totally 'discontinuous' or 'radical' - it possesses some analogue if not in mode of production, at least in mode of use, which dictates it continuation from already existing artefacts, objects or services. The importance of the model lies in its recontextualisation of the product, (its development and subsequent abilities to be reconfigured, customised and adapted) with the use process of consumer-users.

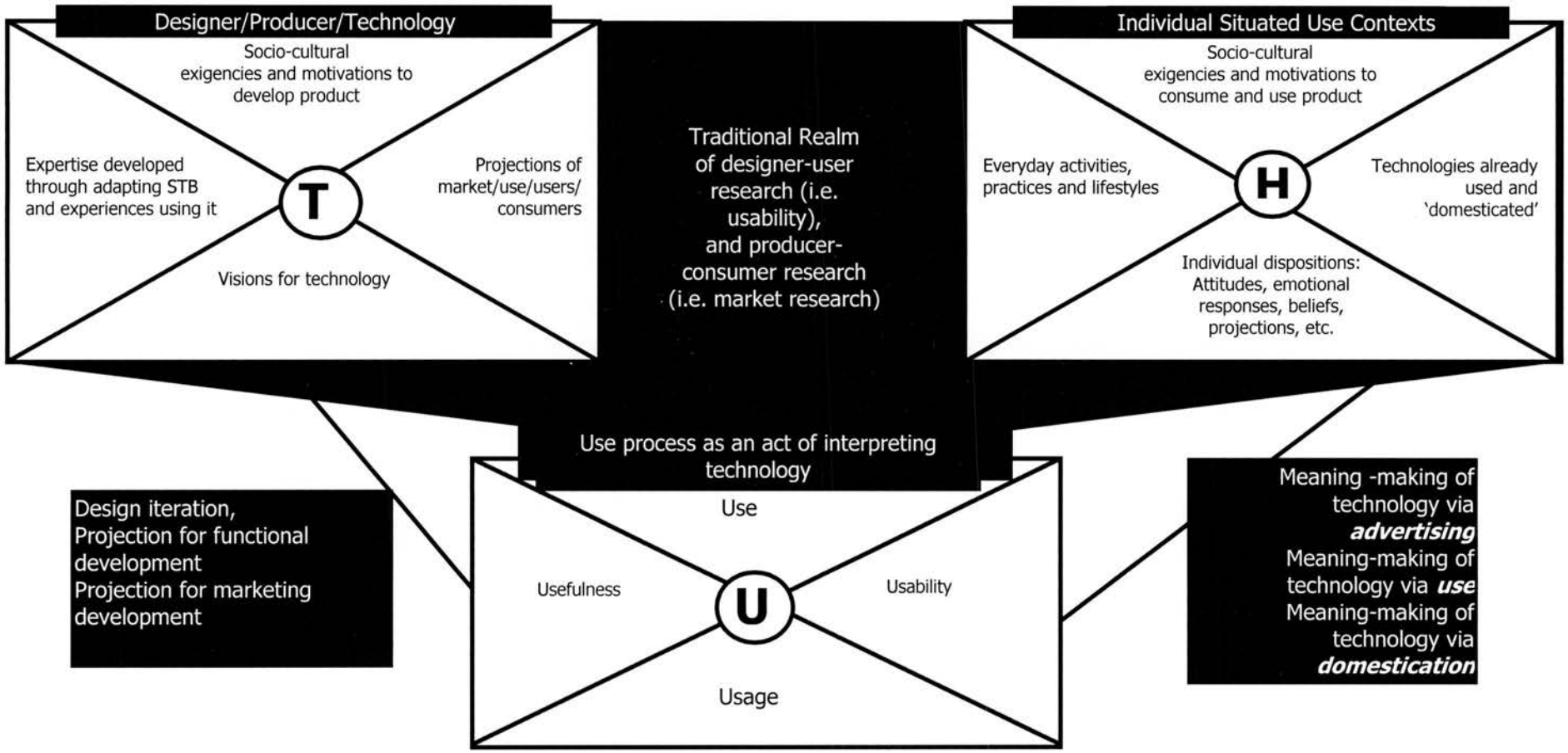

Fig 8.8 The use process as arbitrator of communication between designer and user, producer and consumer, product and lifestyle. Usability recontextualised as a ***naturalised*** part of the use process, rather than as an index of how assessable and usable a technology is with respect to the intentionality of the designer and producer.

When a radical idea (compared with existing practice or modes of use) for a new media technology emerges at the concept level, it is open to misinterpretation or misrepresentation as it flows through the conduit of PR, journalistic reporting and word of mouth. As suggested in Chapter 1, it maintains its 'interpretative flexibility' both as a technology and a technological potential. It is on this level that certain views can be developed, views which skew opinion one way or another, towards utopian or dystopian perspectives or the innovation, predictions of determinism and voluntarism regarding its use and impact, its benefits and its social effects. These, without doubt shape peoples' attributions of a technology, product or service.

Product concept testing has a poor record in predicting eventual market successes. Perhaps this is simply because that it is on the conceptual level - most privy to interpretative flexibility - that it is most easy to promote a scenario which visualises the accommodation of a product into everyday life. 'Doing so' would appear considerably harder to enact, or even it were to be contrived – as it was in the Cambridge Trial – it would negate the kinds of pressures and anomalies that plague or advance the domestication of 'successful' products. Alternatively, it could be the poor representation of the contrived relationships, as well as alien environment, between market researchers, the product and the 'representative' sample of *anticipated* consumer-users.

A trial such as the Cambridge Trial, offers more than simply a unsupported concept. It offers a concrete range of phenomenon - technological hardware (STB and remote control), a range of content and service options, and accompanying discourse including recruitment paraphernalia, questionnaires, invitations to Om's headquarters for 'user evenings' and so forth. All these phenomenon, as well as the fact people were actually living with the technology provides a real opportunity to track how they make sense of the technology, as well as how they relate it their lifestyles, and the other technologies they use day-to-day. It is also an opportunity to explore how the technology prompts them to consider its actual performance and use, and what it

could be through additions or alterations to its current state of development.

The trialists

The user research was conducted in collaboration with participants on the Cambridge Trial. As was indicated in the previous chapter a series of interviews were conducted on user-participants on the CT between the 23rd and 24th of July 1996. The 11 (of an intended sample of 12) households were selected from the 66 participants in the trial.

Marcus Penny – the content and services manager - viewed that within the relations of user to marketer there lay an issue - that of bringing the user's interests into this in an appropriate way. In particular the issue that Penny faced was financing some consideration of the user's interests at all. Everything that he did had to financed and justified in some way. At that moment he was financing and justifying it on the basis of service providers and Om, learning from the process of the trial and the lessons that this taught in terms of how to build businesses in the future. What value was there to service providers in consumer's interests? Who were the institution or firm who would pay for this?

One could imagine that a public sector institution such as the ICT or some of the consumer watchdogs could become interested. On the other hand perhaps a professional organisation would be better placed to conduct independent research. Penny felt that this is a generic problem with all products and all services in that the users in the end don't finance it, hence at the creation stage you've got to deal with the people who are financing it who are the ones who are actually interested and engaged in it at this point. There the people putting their time and effort and investment in on the basis that they produce services to users. Out of that there is a motivation for them to get a real understanding of what the users actually want. Penny thought this is something that you could sell to them if they understood what users really want they will do better in the provision of services.

This seems to be one shortcoming of group decision making processes that is classic

- some processes apparently give rise to spontaneously good products as was the case of the original demo STB. A worst case scenario is also possible however where you have got a bad product which fails to satisfy both the collective needs and individual needs of the group. This may be true, as in the user/marketing working group case where the product is a research approach, the difference is this product is knowledge and not a purely technical system which either works or not.

The notion of 'users' and 'consumers' were an inextricable part of the transactions which took place between the original project team and senior managers and funders. The former being convinced that there were indeed latent mass demands for interactive services, while the latter felt that only a trial could illustrate fully the technical potentials and credibility of the technology and concepts. Users featured strongly again when they became collateral in the transactions which took place between Om (and those responsible within Om for the trial) and potential PSPs. Bounded with the notion of developing and learning core competencies needed for providing interactive content and services, PSPs invested in order to learn of the organisational problems involved with trials and also to learn of what 'average' consumers would make of the system:

> "The presence of NOP (National Opinion Polls) on the Trial has facilitated the gathering of detailed user feedback. The initial data showing usage of services by Trial participants, along with their reactions to their experiences constitutes a goldmine of information for other companies wishing either to participate in other i-Tv Trials or to provide content or services . . . Indeed as such it allows the consortium to evaluate the revenue potential of such services for roll out in a wider context and even for eventual commercial deployment on a regional or national level."
>
> Om promotional literature

Identified as a crucial part of the learning process of the trial, was for firms to understand and gauge the impact of their individual presence on the system. As such the 'public' stage users (as opposed to the designer-users) were to a degree 'commodified', as user access and research was added as part of the value enticing companies to join the service nursery in the first place. Access to such information was unfortunately mediated by a dysfunctional group which was perhaps indicative

of some of the deeper problems of information flows, management and governance involved with the trial as a whole. Clearly, there was not enough effort (or probably resources) in building the sociotechnical constituency of the trial.

On the subject of user research, and in particular, the issue of on-line questionnaires etc. Om's Marcus Penny was adamant that there was a tension between explicit and covert ways of realising what people are doing. His preference was for inference from what they do, or actually use, rather than asking them questions directly. He was of the opinion that it is more liable to lead to real answers and its something which we can do for the first time due to the nature of the system. The sys-log data produced by the system would reap data which would show when the STB was activated by which household, which service/programme was watched, and what the interaction style was. The detailed data of how they do respond to choices presented on the screen. This was an integral part of how Om elicited NOP's interest in the system.

Penny claimed that Om will be working with them to make the correct inferences from the sys-log data and then increasingly to tune the choices that they would present, working in an iterative fashion till the right inference is made. Om would also provide questionnaires on screen for people to do, but Penny felt that there is stages beyond that which they wanted to get to. This stage is characterised by not providing questions, but rather providing experiences or experiential choices - vignettes - and then monitoring there reactions. He viewed that there was a 'whole new approach', an entire new way of market research, which surpasses problems of interpretation inherent with questionnaire use.

However, it is clear, as will be illustrated in the following chapter which outlines trial participant's experiences of living with the system, that user-centred research/design, and particularly 'inferring' from sys-log, is made more problematic when you do not have a fully operating system with all its branches and avenues open. User's functional and exploratory aspirations are confined, and can only reap understanding

of how they coped (or did not cope) with this confinement. However, even with the limitation of the system Penny viewed as an opportunity to get users involved with the design of content and services at an early opportunity.

Approach to users

The objective of the qualitative user research was to understand the trial participant's understanding of the technology. To begin with this to uncover something of the way in which participants came to learn of the trial and the technology. This can impact on 'first impressions' of the technology, in terms of its usefulness and motivations to use, as well as their individual approaches to solving usability problems. It is not difficult to imagine a scenario where a highly enthusiastic installation engineer may help to carry impressions of the system as a panacea to a number of common complaints concerning the existing broadcast media.

Likewise, an engineer may be evasive in answering specific questions regarding issues such as when content material will change, when certain services will become available and so on. Any communication between the companies involved with the trial and the user-consumers will influence perceptions, above and beyond that of people interacting with the technology, content and services directly. Penny remained 'very aware' of this issue: 'you can't do objective research because every contact which you have with the users has an effect on them'. However, in the spirit of evaluation research, the main issue that could be drawn from a useful research project would be to 'make some assessment of what direction and what magnitude that effect is likely to be'.

Penny felt that 'certainly NOP should be aware of these sort of issues'. It was considered that they were there to 'hold the ring and mediate all these sort of questions from the individual organisations and as far as the individual organisations are concerned in their motivations the users are just a means to an end to answer their questions. Above and beyond NOP's involvement of managing and mediating the

orientation of the user research, they were involved in the CT to learn about the new possibilities existing for market research using i-Tv.

Simon (1969/1996) draws attention to the question of how a simulation can generate regarding new knowledge. Simulation is used to achieving and predicting the behaviour of systems. To a large extent, and as was suggested in the previous chapter which detailed more the social process which led to the construction of the user research, and chapters 6 and 7, which illustrated something of the social construction of the trial, the users were viewed almost as intelligent parts of the system. They were viewed as data generators, from which inferences were to be made regarding tweaking the system, its look, its offerings, its functionality and so on. The trial content was only ever a demonstration. It had many promised features which never materialised and this was the single most represented piece of feedback consistent across all interviewees. Simon relates two assertions about computers and simulation:

1. A simulation is no better than the assertions built into it.
2. 2. A computer can do only what it is programmed to do.

Applied to the Cambridge trail this may be taken to infer that the point of view of Om, and even the companies involved in the trial, viewed that since the trial was only a simulation - a demo - that no useful information could be drawn from research. The user research has offered a glimpse into the non-rational, very individualistic lifestyles which are recognised within consumer research, and only now being recognised by those who have for some time developed technology which is to be situated within domestic locations and real lifestyles.

Marcus Penny viewed that i-Tv opened the potential for instant feedback from users. They would provide a marketing or product/service development department with the opportunity to test ideas out on user-consumers, and the feedback would dictate the adoption of the new product, service or process:

> ". . . most businesses are producer businesses somebody sits there in a room cerebrating creating something and there is a very, very long chain down to

> pushing it out, and the feedback back from users back to here is very, very imperfect . . . an individual programme producer can create something test it out and get some instant feedback . . . what will that do for the nature of television?"

In a system which is highly dynamic, constantly reactive, and ever changing it could be said that there would be little opportunity for things to remain stable enough to make inferences or formulate and ask relevant questions. Penny viewed that this was symptomatic on much wider cultural change - "we're coming to be in a reflexive world . . . what happens is that you run the reflexivity and I think it gets to the point of stability emerges its a question of managing through to that."

A picture emerges of the innovation of i-Tv not being driven by simply engineering vision alone. Penny stresses the definite need for feedback, a symbiosis of developing services and content with inputs derived from the user-consumer's tastes, interaction styles and choices. He viewed that one of most important elements of reorientation to this new way of doing business and producing media is that you will simply not survive unless you take intimate account of the feedback and you run your business ultimately on the basis of interaction and feedback.

Such a view bears relation with social shaping theories of innovation, opposed to simplistic models of linear innovation, but rather recognising and bringing to the fore feedback loops happening at all stages of the innovation-diffusion continuum. Returning to the theme of order rising from chaos, he viewed that standards formation arises from such crises, 'if you believe in the approach natural standards emerge out of a dynamic process and are stable because the system keeps them in place'. He sees that crucial to the role of the 'new manger' (one which is in keeping with the new style of organisation) will manage processes of crises and chaos:

> "its something which you cannot plan and direct in the way that your used to it in a mechanical view of the world nevertheless there are structures and if you understand the behaviour particularly in the moving from stability to another . . . you can encourage that process . . . if you understand what lies behind that stability you can encourage or interact with it . . . but you've actually got to observe quite closely what's happening."

However, much like the vision for the self-governing service nursery, it seems that this view remained somewhat utopian in its faith in the system as it stood, and in the users to act as 'intelligent' parts of functions of the system. It is clear that from the above sample of users that there was a plenitude in terms of people's reactions and attitudes towards the system. Many of these would stand to confound and inferences above and beyond the fact that their was little use of the system.

There were several themes recurrent throughout the case studies. Broadly these can be broken down thus:

- Lack of content drove inactivity with the system
- Regardless of problems with content most people still saw value in such a service providing there were programmes which would appeal
- Most people saw advertising as inevitable, however interactive advertisements were difficult for them to grasp or imagine. As a concepts they seemed to appeal, providing they did not interfere with the programme.
- i-Tv would not impact on what they viewed, rather it would enable them more flexibility in their lifestyle
- It was quite obvious the family homes different from each other in terms of uses for television, and that these homes differed from their extra-television activities, in ways which would be relevant for the consumption and use of particular services (i.e. some services simply did not 'exist' for certain households).
- It was quite clear that interactive radio was of little interest to interviewees.

Erlandson *et al* (1993) point out that in naturalistic research analysis is continuous, that the "analysis of data interacts with the collection of data" (p.130). This suggests the flexibility inherent in this approach. Subsequent interviews are shaped by what has been learned from previous encounters; interviews in process may change with respect to what is being offered by the co-researcher. New opportunities for data collection are sized upon as they occur and are considered relevant. Such an organic approach, maximises the research process within real world and often chaotic circumstances. Research and analysis are never fully complete, there is always something, some angle which was not fully exploited or explored. This was the case

in the user research of the Cambridge Trial. The research process was in the end compromised from its full potential. The reasons for this compromise maybe summarised thus:

1. The employment of a semi-structured interview schedule. While this permitted some degree of standardisation of the results, it also challenged the notion of natural trajectories within the interview process. As such they were guided to irrelevant questions (such as asking about there impressions of advertisements which were not on the system), and generally swept along with the pace of the questions as laid down by the schedule. There was some evidence of answers being 'invented' or 'forced' for questions.

2. There was a definite lack of consistency between the interview styles of interviewers. This resulted in some interviewee answers being closed down on points they perhaps wished to emphasise, possibly due to the interviewer's notion of what was relevant or non-relevant to the discussion. Different interviewers have different ways in which they communicate with people in intimate places such as their homes. It is quite easy to imagine that some researchers have particular talents for making interviews feel relaxed and open, free to present their 'genuine' impressions on phenomena, whereas others may unconscious act to inhibit the free flow of thoughts and feelings regarding subjects. This is a difficult problem which must impact to a greater or lesser extent much of human subject research, and is itself an artefact of insurmountable individual differences and experience.

3. Logistical difficulties plagued this project due to the inclusion of a third-party firm for arranging interviews. As noted I experienced difficulties (fatal in one instance) with my interviews, and it was only down to luck and the flexibility of myself and the interviewees to reschedule and fit in the interviews on spec. It is not unreasonable to imagine myself flying down to Cambridge on that day, only to return with no interviews whatsoever. The use of such interviewee recruitment agencies seemed common practice to NOP, who obviously use this company on a regular basis.

4. Semi-structure interviews presume something of the communicative abilities of the interviewees. Those who are more 'vocal' and can articulate in a much more richer way than others may tend to dominate at the level of analysis, particularly when this is done at the casual level. What was indicated from NOP was that the interviews would not be subjected to transcript, and that for their purposes it was only necessary to lift out sentences taken from listening to the recordings. Such a method may leave itself open to reporting on the feedback from certain interviewees over the subtler, but nevertheless relative, feedback of less articulate or outspoken interviewees. Such a problem is of course framed within the larger, more pervasive difficulties of the interview process as a social science research implement, but attention to questions of interviewee articulation should perhaps

be made to frame each of the interviewees' responses. This could be derived from realising the benefits of a more discourse rather than simply content orientation at the analysis stage.

Chapter discussion

Yin (1989: p.23) suggests that case study research is an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when boundaries between phenomenon and context are not clearly defined; and in which multiple sources of evidence are used. " . . . . case studies are the preferred strategies when 'how' or 'why' questions are being posed, when the investigator has little control over events, . . ." There is little in the literature which addresses conducting research within contemporary consortium environments. While, as an organisational structure, they are hailed as an example of how the 'new economy' is effecting business, they offer a particularly rich example of how organisational and political manoeuvring can frustrate particular objectives, in the case outlined in this study, this was the design and implementation of consumer-user research.[142] The case also showed how a group consisting of large companies from quite different industry sectors, encountered and attempted to cope with a radically new area of operations- the production, distribution and *understanding* of digital networks as an alternative channel for their products and services.

There is also an impoverished literature to date which is directly devoted to understanding the potentials of digital networks in domestic locations, compared to the vast literature on computing and communication in the workplace.

The Cambridge trial and its technology most definitely represented a vanguard opportunity to come to grips with the kinds of questions that the new era in domestic media could suggest. This brought to bear an interest in the contexts of interaction, the main distinguishing functional component of interactive over existing forms of

[142] This was the explicit aim of the PSPs, who after were solely interested in the business potential of the systems.

television. And in particular the production and design of interactivity, its facilitation and its reception.

In a purely technical sense there was little difference between Acorn's STB technology and their network computer (NC), produced under the tutelage of Oracle Corporation's CEO Larry Elison.[143] In fact in many respects there is little essential difference between either of these products and their immediate antecedent - the Acorn RISC PC. Essentially what distinguishes the RISC PC from the STB and NC, was similar to that which distinguishes a games enthusiasts PC and a standard office PC - sound cards, graphics cards, RAM etc. Also, the shape, the design and the colour of the box was different. These were each simply different boxes containing different configurations of Acorn hardware, ARM chips and input/output (I/O) cards. The question arises – were Om selling 'interactive television' or were they selling ARM chips? The case has suggested that it was in fact both, but with an emphasis upon the latter. For the large part notions of 'user-research', 'interactivity' even 'interactive television' and 'lifestyle technology' mattered little to them. These concepts were merely the means to an end of developing and selling chips (and related technology of sister companies such as ATML and SJ Research).

However, there were major differences between each of these boxes in the minds of those who were most intimately familiar with the technology, and were required to characterise it and get it working. The designers and developers had a job which was to create a vehicle which would match particular visions of the interactive user and audience. Each 'box' - PC, STB or NC - represented a different system concept of delivering on-line information to the home. Perhaps at the opposite end each box were very different in marketing terms, as each system represented a new promise of the elusive advanced media mass market, the perceived market in which the firm imagined people desiring, acquiring and using their product.

[143] Ellison had visited Om and laid out plans for them to do the reference design for the NC.

Technological change or innovation today often occurs as projects such as the Cambridge Trial - events happening within the other flows of normal business that companies conduct. Many of these projects are complex in organisational character involving various actors from many different organisations. Some projects may 'spin-out' becoming separate firms or as operating divisions. Some, as was the case here, derived from opportunity. But even so, there are still observable trends in the general market, as well as indications of the state-of-the-art of what technologies and services can presently offer. The wiser firms keep abreast of these, and link properly the chances to parse evolving consumer needs with emerging technological potentials in ever-reflexive loops of innovation activity:

> "The different technological trajectories and their technological opportunities do not coexist unrelatedly, but are connected by several influences, devices and feedbacks. Therefore, a single technology cannot be explained in isolation but should be understood in a broader framework. Improvement in one technology can create totally different applications in other technologies or even new technological opportunities. Accordingly, nearly exhausted trajectories can be influenced by other innovations and technology fields which open up new opportunities." (Pyka, 1997: p.208)

Perhaps it is here that the symmetry between 'cultures of use' and 'cultures of production' are lost or confused. What appears in the marketplace to create the gestalt of available products is hardly an infinite range. Even where there is express demand for functionality, as there was on the Cambridge Trial, forces that lie completely on the supply side of the equation hindered these customers not only what they anticipated, but indeed what they were promised.

Within the Cambridge Trial creating the 'mortar' which would join the components together and get them working as an effective whole, was only one part of a more complex whole of learning, developing and understanding. For instance much of the content (comprising largely of the games and educational software), and the video footage were drawn from Acorn's education division and Anglia Television respectively. Development work was needed on both of these elements such as 'porting' the software to the system – making it work on the new platform and with

the remote control rather than a PC keyboard. The video footage also required editing and digitalisation. The largest piece of 'mortar' work was the interface development.

The interface is the site where not only do all the functional aspects of the system's purpose must converge in relevant, purposeful and useful ways, but must also interface with the user in a representational and meaningful way. It can be compared with the learning of a new language - such as interpreting Morse code on the telegraph - the operation and use of the telephone was comparatively easy. It presented an ease of use and quality of communication in such an acceptable ratio that it became of utility -'useful' - and, as a result, acquired habits, situations and conditions of use developed through its integration into the everyday life and affairs of people (de Sola Pool, 1977). But this is often a task of not only engineering but also of aesthetics, and of social learning and cognitive sensitivity and understanding. In addition to the interface, there were further content elements which had to be developed as further partners joined the content and services group – the principal services providers PSPs. These included catalogue-style screens depicting goods, interactive advertisements and the online surveys and questionnaires.

This was an arena that presented real challenge to academic research. Most predominately in terms of attaining access and trust. Companies, like individuals, are not pleased to open their souls at a time when they feel threatened or not entirely in control. From my own perspective the most difficult obstacle was the constantly shifting 'first point of contact'. Was this with Om, the trial staff or the working group on user-research? This led to a kind of 'navigation' within the social structure of the trial, as it unfolded as a social process. Not only that the trial also unfolded as a technical process, the system, interfaces and technology changed over time. It did not remain constant. This was a complex sociotechnical phenomenon, with multiple constituencies that waxed and waned over the course of the project. On a personal level, there were times when I was empowered and other times when I was powerless to influence my involvement in the trial.

On many occasions, I found myself having to reiterate my purpose and relationship to new members of the service nursery (often by proposal, or extended introduction). Each time this was interpreted differently, depending upon the new member's commercial orientation with respect to their core business, or their interest in the trial. During this time I was returning to Edinburgh, where I was developing the theoretical aspects of the work. This was subject to constant revision, responding to issues of a social or technical nature as they arose. For instance, the Acorn consultants desire to implement QFD, or the shift in the user-research group's interest towards interpretation of their content material. This drove me to explore the considerable literature that addresses these areas, and shaped the evolving ideas of CU (and particularly the promise of user-research in constituency-building).

Beyond the visits to Om documented earlier, I engaged frequently in casual conversations with those working on different aspects of the project which also directed me towards specific areas of study. For instance, a member of the Om marketing team was interested in how the 'video violence' debate influenced perceptions of i-Tv.

The members of the working group often had multiple roles, tasks and projects they were working on within their firms. They came to the group not only with general directives agreed upon with their respective firms and upline managers, but indeed individual perceptions of the technology and the trial based upon their own existing knowledge, expertise and viewpoints. They also brought to the meetings something of their company culture, and again, their own individual interpretation of it. This shaped impressions of what was, and *was not*, valuable in the user-research project. It also dictated what *could be* expected from the trialists. For instance, the BBC came from a culture where their public was termed *viewers*. Nat West and Tesco on the other hand had *customers*, NOP had *subjects* and *samples*, Om had *users* - each viewed members of the 'public' often in quite different ways. This manifested in different values and feelings in how to approach and deal with trialists.

This knowledge also had to fit in with other preoccupations which members had at the time. Unlike Om and myself, they were not dedicated to a full time focus on the trial. This impacted levels of commitment and motivation, which varied within the group. This also influenced its functioning. What was taken from the meetings fed back into quite different company structures, and so most likely came to 'mean' quite different things with respect to developing perspectives of the trial in general, or how to iterate and innovate their particular service offering. Proposals I made, often manifested later, sometimes 're-engineered' by others (such as the NOP background questionnaire being close to my own 'media and leisure activities questionnaire' and BMP's qualitative 'check list' being similar to my earlier proposals I had passed to them).

There were clearly issues regarding research methodology that were raised during the various dialogues regarding implementation. NOP qualitative were quite keen to tape interviews, but not transcript them. They favoured 'lifting' out comments that seemed to reflect the aims of the project. Whereas in academia there may be some pre-occupation with method and rigour, as research is often tested on its methods as much as its results, this may be swayed in private sector social research for the purposes of result and affect. An academic researcher proposing exacting methods can appear in such dynamic innovation environments as too slow, pedantic, resource and time consuming. In industrial settings lust of result demands quick fixes often at the expense of rigour.

Also, there was a privileging of quantitative over qualitative information. I discussed this bias with respect to scientific investigation. The reasons for why quantitative investigation was favoured here include the research routines of NOP, and the seduction of automatic production of use data by system-logging. The promise of 'automatic' understanding of use and usage is extremely attractive.[144] Marcus Penny viewed that i-Tv opened the potential for instant feedback from users. They would

[144] A primary business rationale behind the QUBE trial was to use interactive cable for audience research. It allowed cable operators to monitor what channel people were watching at the time. (Davidge, 1987) Such 'automatic' registering of behaviours lie at the core of 'post-fordist' methods of

provide a marketing or product/service development department with the opportunity to test ideas out on user-consumers, and the feedback would dictate the adoption of the new product, service or process:

> ". . . most businesses are producer businesses somebody sits there in a room celebrating creating something and there is a very, very long chain down to pushing it out, and the feedback back from users back to here is very, very imperfect . . . an individual programme producer can create something test it out and get some instant feedback . . . what will that do for the nature of television?"

But in a system, constituency, or network which is highly dynamic, constantly reactive, and ever changing I contend that there would be little opportunity for things to remain stable enough to make proper inferences or have the time and space to formulate and ask relevant questions. But the services manager viewed that this was symptomatic on much wider cultural change - "we're coming to be in a reflexive world . . . what happens is that you run the reflexivity and I think it gets to the point of stability emerges its a question of managing through to that."

Marcus Penny stressed the definite need for feedback, a symbiosis of developing services and content with inputs derived from the user-consumer's tastes, interaction styles and choices. He considered one of most important elements of reorientation to this new way of doing business and producing media is that you will simply not survive unless you take intimate account of the feedback. Business must ultimately run on the basis of interaction and feedback.

However, Penny saw the notion of interaction and feedback in much more global terms with respect to the Cambridge Trial and i-Tv. He viewed such an approach as developing an entire generation beyond this. Digital media permits entire business processes to become interactive – manufacturing to retailing and customer-care; "given that the whole process is interactive . . . we're actually building in quality . . . its an inherent process . . . and you don't need to bring it in from outside as a separate process." It is the application of re-engineering to a system that is inherently un-

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understanding consumer behaviour.

reengineerable. It is inherently non-linear. Such a view bears relation with the non-linear theories of innovation, and R&D (such as when Fleck, 1988; speaks of *innofusion* – innovation through diffusion).

Opposed to simplistic models of linear innovation, this non-linear views recognises and draw attentions to the way in which feedback loops can occur at all stages of the innovation-diffusion continuum. Returning to the theme of order rising from chaos, The Services Manager viewed that standards formation arises from such crises, 'if you believe in the approach natural standards emerge out of a dynamic process and are stable because the system keeps them in place'. He sees that crucial to the role of the 'new manager' (one which is in keeping with the new style of organisation) will manage processes of crises and chaos:

> " . . . its something which you cannot plan and direct in the way that your used to it in a mechanical view of the world nevertheless there are structures and if you understand the behaviour particularly in the moving from stability to another . . . you can encourage that process . . . if you understand what lies behind that stability you can encourage or interact with it . . . but you've actually got to observe quite closely what's happening."

However, much like the vision for the self-governing service nursery, it seems that this view remained somewhat utopian in its faith in the system as it stood, and in the users to act as 'intelligent' parts of functions of the system. It is clear that from the above sample of users that there was considerable variation in trialist's reactions and attitudes towards the system. Many of these would stand to confound inferences beyond the fact that there was little use of the system due to lack of content.

Such research should also be contingent on identifying exactly what the knowledge objectives of each company are, rather than trying to muddle through with a jointly arrived at compromise which suits neither the collective nor individual interests and needs of the group. This appeared the case here. Whether this was down to purely poor management and co-ordination, or lack of communication flow, or simply due to some companies not having an exact idea of what they wished to derive from the research. I would argue that it was also due to the social aspects of the trial being

much less tangible as a discursive practice than discussion of technology. A working technical system did exist in the Cambridge Trial, however there was no real product emerging from the user research, and little product emerging in terms of satisfactory content.

It is obvious that there was some conflict between myself and the self-appointed chairman and co-ordinator of the group - Seth Paladopicous . This may have stemmed from an over ambitious initial presentation at a time when the group was only finding their feet within this new venture. It may also have stemmed from NOP's obvious wish to be considered 'the' experts in social and market research whilst perhaps realising their own lack of expertise in coping with the particular characteristics of interactive media. Their expertise was in mass media (and most significantly large-scale political polling). In addition, Paladopicous had explicitly raised the point that I was a 'freeloader' in that I did not represent an organisation which had contributed some £50,000 pounds in order to 'learn' from the trial. I was merely offering my services free of charge, and was interested and willing to invest my time and the resources of the ESRC (in funding my travel and accommodation while doing field research) in order to interview trial participants for my own, and the group's benefit. This certainly compromised my position. In the end, however, all data - qualitative and quantitative were offered to me for analysis, regardless of my exclusion from the group.

The Om case outlined in the previous two chapters illustrates something of the dilemma which is encountered when trying to elucidate whether an innovation is technology-push or market-pull. While few commentators would argue that they exist in a pure form, the Om case suggests the realties of innovation - that chance and opportunity plays a large part in such processes. Who the end-consumer-users are remains non-distinct.

> "The market demand may come from private firms, from government, or from domestic consumers, but in its absence, however good the flow of inventions, they cannot be converted into innovations . . . Some scientists have stressed very strongly the element of original research and invention and have tended to neglect or belittle the market" (Freeman, 1982: p.109)

Returning to Woolgar's (1991) 'technology as text' thesis, this concept applies equally to those who become involved with the processes of design and production, as much as those who finally use and consume such products in domestic spaces. It is comprised of all those who are involved in its propagation, production, and use. **Arguably, however, the working group on user research seemed very distant within from the practice of technology development.**

Predominant in the Cambridge Trial were the technology partners and the PSPs. They were users of the system, and they applied their own particular interpretation of what it would and could do for their businesses. Which as already maintained entailed different levels of motivation and commitment to make it work. This is perhaps where Marcus Penny's "common interest that it [the service nursery] should exist" indicates a certain presumption in that everyone would magically bond through shared visions of the system and service future. However, one aspect of the trial which was shared mutually was an interest in how the public, the ultimate target market for the product, would react. The PSPs for instance had no real interest in the technology, they wished to evaluate the content and service potentials of the system.

The purposes of these trials have included technology testing, market positioning and application and content development. However, it is also worth mentioning that trials have been more often announced than run, and more often run than rigorously evaluated. **No trials have been run to perfect consumer-user analysis. Nor have they been run to develop research approaches towards interactive media.** They have been run to test new business potentials. However, the promise of user feedback is crucial in the negotiations enrolling support both within the firm and from potential partners (Nicoll, 1999). A working 'image' of the technology, and of the users is the rhetorical tools that guide development. Both were 'texts' and purely elements within the discourse of these meetings.

Lessons for firms

Several key points may be summarised from this study:

- **Trials have distinctive social and technical elements. And these are distinctive within their own categories – i.e. use of one technology may vary from that of another in subtle and obvious ways. There is a real danger in melding human and non-human actors in analysis. It blurs their unique properties, which may be useful for academic analysis, but may compound an already endemic industry view which has it that users are *already* only an intelligent part of the technical system. This is whether they are planned, anticipated, scenic, or actual and real. They are basically viewed as elements which respond, or will respond, and that provide, or will provide data useful to consolidate business plans and goals.**

- **Retrospection, while an essential starting point, should include a direct appraisal of the usefulness of the technology. If designers' can use the technology and services with their families and friends, without responding emotionally to any criticism they may level, then they are half-way to creating a good product. Warning signs are when staff *do not* want to live with their own product.**

- **Informal meetings with users, consumers and trialists can provide valuable data, as can more formal or technical means of research, such as usability, online questionnaires etc.**

- **Working with consumer-users or trialists, *as well as* partners in product and service development can operate to everyone's benefit. Getting people involved, even if one has to play the 'education card' – i.e. wiring up the local schools the favourite strategy of computer firms - can breed new uses.**

- **Appoint a member of staff to articulate and co-ordinate knowledge flows, both internally, externally with partners and with consumer-users and trialists. Be ecological with communication, reduce noise, and make sure that the right people get the right information. Such a person should act as an exchange of knowledge and work towards developing the kind of trust that is integral to such a role.**

- **Understand and consolidate organisational structures (and knowledge flows) through feeding back structures to those involved, and eliciting them to comment (again ecological communication rules should apply). There should be active effort to minimise presumption but to accent, creativity and different views.**

- **Staff, and partners are valuable assets but so are consumer-users and trialists. It is not bad to consider blurring the distinction between social actors, and to bring 'common sense' to heed in highly innovative projects. Everyone in such a network or constituency can help ground ideas into worthwhile, useful services, which provide good experiences in use, and encourage frequent and long lasting usage.**

Further work, issues, and ideas

Hunt (1994) argued that although we know a lot about how companies compete in the market place we know little about how they collaborate. In this study I have only scratched only the surface of what is perceived to be an area of outstanding importance for the further development of new media organisation in the future. The Cambridge Trial, its managers, designers and participants offered a rich environment for exploring the multiple dimensions and reality building in the process of design and management of a new media system. Further, it provided an opportunity to consider experiential approaches in the technological and marketing evaluation of what may be considered a radical or discontinuous innovation - from an organisational perspective as well as the perspective of use. The full nature of the domestication process with respect to the case of the trial nevertheless remained elusive. Any 'symmetrical model' of design/use, producer/consumer was in effect unrealised in this case. Certainly, there were most definitely concepts of domestication anticipated in the design of the system. However, there was little to evidence Silverstone and Haddon's (1996: p.46) notion of "design completed in domestication." This can only happen when technologies are successful, when they fulfil designer-producer *and* consumer-user expectations. The system, and in particular the content aspects of the system, never matured or was never developed to the extent necessary to constitute the naturalised use process of domestication. Instead, it remained an artefact, an anomaly within the house, transparent not in use, but though lack of use, usage and usefulness. Lack of content options led to lack of participation, and therefore the technology can be considered only evocatively - capable of providing a base by which trial participants were able to comment and project upon 'if it did work' or did fulfil all it was built up to provide.

CU as an applied research approach may benefit by serving as an index of what can be ecologically studied at various stages of technological development. The scope and scale of consumer-user involvement in the technological and marketing development of programmes may be viewed as a co-evolutionary and co-developmental process. The cultural distance of designers-producers to consumer-users may be reduced leading towards the grail of ever-more useful and usable products. What will be interesting will investigations into other, different product groups and categories - perhaps where context plays a larger place to the use process and the domestication of products.[145]

This brings to bear a number of issues regarding people's ability to anticipate and imagine functionalities and modes and conditions of use. Will such projections suffer from the experienced by marketers in the application of 'soft' research approaches such as product concept testing? What is also clear from the empirical work in the organisation of the trial is that it is important to form a more explicit understanding of what partner organisations require from consumer-user research. This suggests that the individual way the consumer-user is expressed within their institutional perspective should be accounted for, as should their motivations for eliciting consumer-user information and how it will be applied or inform strategies.

There seems to be an implicit and perhaps somewhat restrictive boundary in place between the current design, consumption and media literature. Most articles within the design literature which look at interpretivist methods tend to focus very much on the application of such ideas to the design process itself - contextual inquiry is an example of this. On the other hand, when understanding users is the focus of interpretivist interests, HCI tends to be the forum for discussion, but a forum which seems to have a less sophisticated understanding of interpretivist approaches, perhaps as a result of a more highly focused area of interest (c.f. discussion of the implicitly

[145] Such an opportunity currently exists at the time of writing with the author's involvement with a Design Council project*: Information-intensive products*. This is concerned with the application of CU as a framework investigating a range of so-called 'smart products' - including that range of products

extreme stance of ethnographic approaches, above). Suchman's (1995) article is very much concerned with modelling users' activities.

The essence of this thesis has placed a strong emphasis on co-evolving systems of design, producing, meaning making, myth-making and use. It has stressed the importance of dynamic conceptions of context upon a reality that pivots around the process of use, what further can be expected from a semantic model of design, consumption, use and domestication? Further work will consider how this may be mapped in such a way as to constitute guidelines of 'best practice' for designers and those who are stakeholders in the design and implementations of technology and marketing trials.

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which contain chips supposed to raise the 'intelligence' of everyday products and objects.

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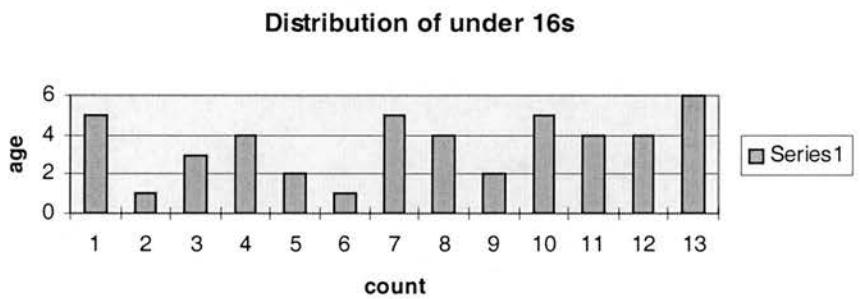
Appendix 1- The Cambridge Trial Participants

Who was on the trial?

As outlined in the previous chapter, Om faced a recruitment problem with Phase two of the trial. However this was, solved partly by recruiting via schools in particular areas of Cambridge. It was anticipate that by giving schools authorware, family households would be attracted to participating through being able to have a 'gateway' into their children's school and their schoolwork.

In July/August 1996 there were 66 households in total and these were interviewed via telephone by NOP, who asked them a 10 item questionnaire session. The following data was based on their findings. 31 of these were family homes with children. In all there were 210 people involved in the trial, 56 of these were children under the age of 16 (average age 3.5 years). There were 11 children over 16.



The average age of the chief income earner was 37 years old. Of these (n=66) 29 belonged to demographic group AB, thirty-three to C1C2 and four to group DE. Most of these described their households as light (26) or medium (24) television viewers as opposed to heavy viewers (16).

Perhaps unsurprisingly, most of the chief income earners watched television 7 days a week, regardless of whether they were light, medium or heavy users, and regardless of demographic. However, the amount of time which was spent viewing television each day was less in the higher demographic group AB (approx. 3 hrs. a day) than group C1C2 (approx. 3.75 hrs. a day) and DE (approx. 5hrs a day). A quarter of the families with children (of any age) watched between 2 and 3 hours a day.

PC ownership

Approximately half the trialists (37 56%) owned a home PC (not a games console). Most owners were in the higher demographic group (20 69%) against (16 48%) of C1C2 and 1 person from of the DE group. There seems some relations between PC ownership and weight of television viewing. 73% PC ownership in the case of light television viewers compares with 25% PC owner ship in the case of heavy television

viewers.

	Weight of TV viewing		
	Light	Medium	Heavy
TOTAL	26	24	16
Yes, own a PC	19 (73%)	14 (58%)	4 (25%)
No	7 (27%)	10 (42%)	12 (75%)

The was roughly an even split in PC ownership/non-ownership (45%/55%) between those households with children. Pat of this was due of course to the households meeting the selection criterion (which was pendent on PC ownership).

The information derived from this study is weak in the sense of illustrating anything of the dynamic of household affairs above and beyond that pertaining to the question items.

The sample for the qualitative interviews

From the 66 an initial sample of 11 houses were chosen for the qualitative research. In terms of household composition these were;

F002 2 adults, both working. No children at the address.
F010 Couple, 2 children (1 boy 1 girl). She - solicitor, he - local Councillor
F011 Couple. 3 older children 1 of which is studying.
F016 Couple, 2 children.
F018 Young couple, not married, both working
F019 Single male, working.
F025 Couple, both elderly & retired
F028 Couple, both elderly & retired.
F033 2 adults, single, studying
F040 Couple, 1 child age 13
F071 Couple, Both working.

N.B. Number donates the identity of the household by sys-log.

This sample was supposed to reflect the criterion as defined by Laura helm (NOP) and Will Collin/Jon Wilkins (BMP DBB)(outlined in Chapter 9). There was another household added to the list.

The sample were recruited by a London-based fieldwork recruitment agency used by NOP - Phoenix Fieldwork Ltd. These were responsible for contacting those households which were allocated to the qualitative study, asking them to participate in our project, and arrange the times for the interviews. In the case of my interviews they had failed to confirm the interviews on the day, thus on arrival at one of my households at the appointed time the interviewee was found to be out. The other interviews, although completed, had to be rearranged from the scheduled times. This was because people were not available due to their own rearranged plans, family in

hospital, and one household busy making dinner for their lodgers.

The 12 household were evenly divided equally between the three participating research teams -myself, NOP and BMP DBB. We each had a discussion/checklist which was drafted by BMP DBB. This had emerged from sharing of issues (see previous chapter), and substantive work I had done in the way of questionnaire development. The intention was that this would be implemented in a open ended way to promote discussion of the use of the system.

In each case, all the of the family present were presented with the questions. Answers were spontaneous and sometimes negotiated and/or contested. The guide provided some form of guided towards the conduct of the interview. This was of importance in this study due to the use of multiple interviewers. Interview guides provide some element of standardisation across interviewers, where their approaches, manner, appearance, communication abilities etc. may vary (Robson, 1993; p236). Most households had been contacted by Om in April 1995, and connected in September, 1995.

CASE STUDY 1 - FO40

Two adults and one daughter (aged 14 year old at time of interview). The father and daughter were interviewed. A two TV set family, the daughter had her own set in her room, although this had only been there for six months. They described themselves as heavy viewers, using both cable and video recorded programmes, although the father stated that TV does not intrude into their lives as they "tend not to be driven by it. There was some contention between them in respect to what the daughter actually used and which programmes she viewed. They did not watch soaps. Their main motivation for signing on to the trial was to get the free movie channel as well as being curious; they wanted "to see what is going to be involved".

They had understood the term of "video-on-demand" to mean "You pick up a film [such as from the video store] that [or when] you missed the programme . . . The impression was given that you if you missed a programme after a couple of hours it would be on ITV you just (click) and put it back on the interactive thing."

The father felt that he had "got hold of the wrong end of the stick", in that he anticipated that the i-Tv service would have permitted the pulling up of programmes he may have missed. Of course due to the content limitations on the trial such a facility was not available, however he "had watched the news when something big has happened and we have missed it." The daughter had watched all of the survival programmes. They had listened to a "couple of the radio programmes but they don't seem to change very often so it's the sort of thing you go in there and you click it through and you think you watch the screen and you get a radio programme and it feels odd." Scaling the service against the Internet it was valued as a "1 or 2" (out of 10) by both father and daughter.

The father's main use was now "90% Internet". If he really wanted to use Internet he

felt he would probably "hire a PC and get the proper gear and do it properly." In respect to paying for services the father "hadn't given it a thought," but felt that if the service included the Internet he would pay for it (the £5 suggested by the interviewer, and possibly £10). There was some contention around the daughter's use of the Internet facility. The father saw that she could not access the Internet through the system, but she insisted that she could but could not "get anything I want to." They had managed to access a pornography site which should have been filtered. This painted quite a different picture from the father's description of himself "charging through the Internet". They stated that he now accessed the system a once a week, predominately to use the Internet, the daughter on the other hand used it quite often when it first arrived and then "completely forgot about it." The daughter described the mother as using it "occasionally about the same as me", which was about "About twiceish" a month. In respect specifically to the Internet faculty the daughter viewed that she thought that the mother "hadn't actually found the time to go through it. The father however, disagreed, saying that his wife had accessed "hardly at all."

The father was not a Nat West customer, however he was interested in what Nat West were doing (he had previously worked for Barclays). Again, this was driven by him being "just intrigued with what they were doing and how they were doing it." The girl felt that she was not even drawn to access the Nat West service due to the "because the bit at the beginning when he's (the actor) sitting in the chair and it's so irritating."

Their reaction to the notion of advertising was favourable. They had associated the banner ads on the WWW to be that which was paying for the service. The father could not understand why the BBC "doesn't have adverts." The advantage of being able to "zap" through the ads was only seen as a slight benefit to the father, who was not bothered by them. The daughter recognised that the adverts were sometimes "a lot better than the programmes." As regards to target marketing the father rationalised the process, associating it with junk mail, and criticised its weaknesses in relation to properly asserting an individual's status and circumstance. On-line market research, the on-line questionnaire they found a "fairly laborious process." He also felt that he was "just trying to feed good lines through."

In terms of usability the father found it a "Piece of cake . . . Very easy, very slow." He was "tempted to say you can lose interest, but I won't, when you are waiting for it to happen." However, felt that "too slow is pushing the case but it is slow but I wouldn't say too slow." He saw that this was relative, and depended on what "what you are used to."

They did not subscribe to movies and sports channels as they are not interested (he felt like they only watch in the region of one movie a month). His job involved evening work and demanded flexibility in terms of time. He did not know when he was going to be in the evening and if he were out in the evening he would be unsure of which time he returned.

In respect to his view of the future of i-Tv he saw that they (those managing the trial)

would have to sort out a lot of "bugs" and "get rid of things." They would have to speed up the operation of the system as people are used to "instantly entering." They would have to raise the content level. He was aware of the problems with copyright and performance rights as the main obstacle to the system's success. He felt that once VOD and the Internet were working then they could take time to develop the other services. He also noted that much of the local intelligence that was supposed to come through the i-Tv was actually on the Internet. In terms of hardware he would like to have an add-on alpha-numeric keyboard (for the Internet).

Case study 2 - F011

The second case study was a family home which comprised of three children and a mother (who was at home - a full time carer for her children) and father. Two of the children were present for the interview. They were a four television family (one was recognised by the mother as broken). One set in the living room, with a VCR, and one in each of the kids rooms (3 bedrooms).

Their patterns of viewing were mainly the children in the afternoons, with the children's programmes. The mother generally watches in the early morning and in the early evening with soaps. The father's chief viewing time was from 7pm onwards till about 10pm when he often goes to bed (he rises at 5.30am). He was particular and would watch strategically. The mother would sometimes video material in the morning (mainly soaps such as Sons and Daughter and Neighbours) to watch after 10pm, or would watch a late film. The children also watch the Cartoon or Disney Channels. The children get to dominate the TV on Saturdays (through the day).

They evidenced a strong strategic position in their viewing using the VCR. The mother could have up to "two hours to watch of videos a day" (Mainly pre-recorded soaps). Due to her obvious heavy use of video material she welcomed the notion of having on-demand soaps. They were subscribed to cable and had the movie option, although they were pensive with regards to how much value it was for them. They would sign to the movie option in winter, using their video recorder to record a "lot of films, 2 which they would then watch late at night in the summer when they spend more time sitting outside and going for walks): "That's why we tape more because then we can choose when we want to watch it." They also taped things for the kids as well. They had possessed a VCR "for years" and in fact could not "remember when we haven't had one really." The mother felt that TV tends to "rule you a lot" and that she "had to record these certain programmes."

The father saw that his wife was "addicted" to certain programmes. He also saw a similar effect in his son; "It's good control, I mean, like him. Half the time he doesn't sit down but soon as he comes out of school you put Disney Channel on and he'll sit glued to it until whenever - teatime." However, it was recognised that "Half the time it's on and nobody's watching it." The father put this down to a "habit."

They related that they use the radio channels while they were doing things around the house. The father's main leisure time activity was fishing; "usually go at least twice a

week. I've watched fishing programmes not to get information of them because, I know quite a lot, you know I fish, I'm a match fisherman, I fish matches every week . . .I don't spend my life fishing or anything . . . But it is my passion" He alluded to the fact that watching fishing was "not for information" but rather for enjoyment "I mean you are sitting there watching that float go down and hope it goes down because [he knows what it feels like]."

Both had completed the on-line questionnaire. They both felt that this method of answering questionnaires were easier to administer.

In respect to news the father used teletext over i-Tv; "I think at the moment - call it laziness or what - but if that plug is switched off on the interactive, rather than go up there, turn that on, get my pin number out and put that in, I can only just flick a switch on this and I have got teletext on."

They referred to the schools link as being "very good" when it is all up and running. She thought that it would be a big part of schools. Their child had used it at school but "he says he's used it, but he hasn't really come home and said what he has been doing on it." However, even though his school was listed, there was no access as yet. They had not much contact with the schools via traditional means.

They drew from the promotional video the impression that you could "call up any programme you want and whatever . . . the way it came across to me was it was like hiring a video but not paying for it in that sense because you could watch what you like, watch what you want, stop, go back to it . . . Watch some of the film and go back to it which is exactly what we do [already with the video] . . . , call up any programme you want and whatever" It had also mentioned something about the children and computer games.

The banking services were unattractive, as they were not with Nat West. In respect to adds, the father did not want advertisements which interrupted programming. He liked quizzes and the thought of a quiz on a subject matter he liked, particularly if their were a chance of winning something he liked that. "If you had a chance of winning something, yeah, I think that would influence a lot more people."

Both felt that i-Tv carried potential for the future; "If it does everything it says it's going to do then yes - because like the games - it replace - needing your, I mean at one stage we had got 4 different games consoles and yes, something like that." [mother] "I mean - 5 [games consoles] we had - but as I say I think if there was a lot more scope of programmes on, yeah I again, I hardly ever go to a video shop or I don't go to a video shop to hire a video but there are a lot of things I would like to watch, not only film-wise, it's great I like things like wildlife - any programmes like that.

CASE STUDY 3 - F019

The next household 2 was a 3 person shared single household, the interviewee a

young single male. The household viewing activities were relatively insular, with no communal living room. However, there was a television in the kitchen, which was black and white and was used like a "stereo . . . when the house is really quiet it's like having somebody else there in the room isn't it." The interviewee's television was the only TV connected to cable. The TV was a 25"model, with PROLOGIC sound. His use of television was an hour or two in the evening (after 6pm, perhaps 10.30pm - 11pm weekdays) and about half an hour in the morning. He made several references to that pointed to the fact that his main use for television was for relaxation, although he generally felt that this was time "wasted." He had about 5 or 6 programmes that he would strategically watch per week.

He did not know what his plans were from "one night to the other, " as he tried to "get out as much as I can." This is especially true in summer, and more generally at the weekends. He had just recently bought a SONY playstation and this was now absorbing more of his leisure time. His use of hired pre-recorded videos were rare, as he does not "often get time to just sit and watch a film." He merited cinema over television, for new movie releases. However, television was considered to play a major role in his everyday life; "It is something - it's like a connection to the outside world and that's why in the morning the first thing I do is switch the TV on and listen to the news and then if there is anything happening ."

His main motivation for going on the trial was "Because I just thought it offered so much opportunity to try anything. I am quite, I'm really into technology . . .I think it is really exciting what was actually offered potentially." These expectations were dramatically boosted by the literature. This view tempered by actual use had been jaded by the lack of content but he maintained very positive regarding its potential which he saw as "incredible."

With respect to educational material he hoped for content which would have added to lifestyle activities; how to play better sports; cooking; DIY.

He noted that from the time the installation date was suggested it took a further 6 or 8 months to actually connect; "I thought the admin. at the beginning seemed really good but then when the practice that came along it was just like a bit shaky."

His expectations for the shopping were not so articulated; "I wasn't really sure because I didn't really understand how the shopping would actually work . . .I just sort of waited to see how it would work or not as the case may be."

He also expected networked games; "that could link to whoever else was on the network on the interactive TV at the time so you could actually play against other people." He felt his television viewing routines would change if the i-Tv system worked properly. He would still watch his 5 or 6 programmes through the week, but the "spare time instead of just sitting there and just aimlessly flicking through or just watching a programme then I would be using the interactive TV instead." He felt that targeting his viewing, through the choices available with i-Tv would make his viewing time more "productive."

He found the service slow. The general usability of the machine was considered good, however not all of the services had been reliable. He claimed that he would not know how to access local information from teletext, however he associated that the web site was something specific to Cambridge. He accessed local information 2 or 3 times a month, mainly to locate local intelligence, cinema box office phone nos. etc.

While are that i-Tv was still in its developmental stage he felt that it was still a part of the future; "Yeah, I think it has got a really big input into the future and it has got so much potential - you know it is quite sort of WOW you know. What could happen it's just unbelievable but it's just the reality at the moment is a bit sad really. Yeah I think yeah it has got to be some form of interactive you know who does it or how we do it - there has got to be some."

Compared to the Internet he found it "It's a lot more user friendly system. It's like everything you put down well what do you think of the interactive and you say well if you put some stuff on it, it will tell you. If everything was on it, it would be superb . . . it's [i-Tv] probably better because it's a much smaller - I mean interactive [Internet?] is so huge that trying to meander round it is just really difficult. Where they have gone and made small little area of little titles and so intrinsically they have got a much easier task to make it easy to use."

The main problem was that they "promised so much and yet didn't have the 10% of what it promised which tends to give you a bad [feeling]." This respondent also 'read' into the lack of programming. "They are obviously having financial problems or are they just - or they have got bad management or are they actually having problems and about to collapse or you know. He had a girlfriend in London who had insight into the financial affairs of Om and indicated that they were having difficulties.

CASE STUDY 4 - F018

Interview were a cohabiting couple in their early 30s - no children - who have student lodgers who board with them. The television is switched on around 3.30pm, and switched off around 11pm till midnight. In the mornings it is generally switched on around 6 till 6.30am for news (man) and again from 7 till 7.45 for the *Big Breakfast* (lady). The man preferred news and weather, sports and these documentaries, survival programmes and "that kind of thing," while the woman preferred viewing was soaps. They both watch quite a few movies as well. They receive the Movie Channel (provided by the trial) and they had a large collection of pre-recorded videos over here. Before the trial they would only subscribe to the movie channels on cable during Christmas. They also subscribed to sports. They also video tape a lot of material. Since they had lived together they have not bought as many pre-recorded videos as they did before. They normally tape films and comedies. They had two TVs in the house, one in the living room and one in their bedroom. The living room is shared with the lodgers and the bedroom TV is used for the woman watching soaps. The man to also used the bedroom TV to help him go to sleep.

Their main motivation for coming on to the trial was curiosity; "I was just interested

to actually see what this new concept could actually do and I liked the ideas of watching, because one of things is nature programmes and there is a massive selection of that which is my cup to tea." In respect to their anticipation of using the woman remembers being told "that you could actually decide what you wanted when you wanted to watch "But we really honestly, until they actually brought the box in, we didn't really know what it was going to involve." Services such as shopping were anticipated as "doing the shopping [via the TV] you can place your order and then pick it up . . . I quite fancied that rather than travelling round Tesco's." The man thought that this "really does appeal." This was primarily due to them not having a car.

The woman felt a little reticent about ordering from on-line catalogues, however she had a catalogue and this was the only place "we could buy some of the furniture from that we have got. Yeah we try not to use it excessively . . ." They had not used the interactive news "it's just local news that comes on . . . I mean when you have got Cable TV and you have got that Style News CNN news on constantly and it's as easy to flick on to news than it is to go into interactive TV. Isn't it?" They had had some kids over and they had used the children's material, "but they get bored with it after a while because it's just the same thing all the time."

They were ambivalent about TV advertising "any sort of TV has got to be paid for somehow." The woman viewed there could be a place for classified adverts. "So like in the local paper where you have got different headings for different things like jobs vacant, accommodation to let that sort of thing." Ads which offered cash prizes, discounts etc. would be welcomed.

Generally they felt that there was a poor choice of programming available through the service. They wanted to see quality programming (such as the detective series *Inspector Morse*); "I mean that's the thing if there were things like a selection of Morses, Taggarts and things like and you can just go in select one of that well I mean that would be brilliant. I mean that's better than having Cable TV if you can watch what you want when you want it."

They had not even realised the on-line market research and there was no mention of web access, nor educational programs.

i-Tv was viewed as making "the video shops redundant" (woman) "wipe them out (man)". But the trial was recognised as having to illustrate its potential: "But you really need to see what they can offer as a package. It's not like you know you got biscuits it's not like you can have a nibble and you don't know what else is inside you know. You have got to see . . . You have got to eat the whole bit really and then you can - I mean if it was as it is now and I had option to buy it - I wouldn't buy it." However, he followed up by saying "If the package improved, the selection improved and then it would be a real - or we could then afford to dump Cable and take out interactive TV. . . I wouldn't even need to be pushed on it. I'd get rid of Cable."

It was clear that entertainment would lead the field for pay i-Tv; "I don't think it

would be worth spending the money to have interactive TV just to save you going to Tesco's" they considered that cable as it is cost a lot of money. They anticipated that i-Tv could be prohibitive in cost "You think how much pay off to Cable in a month. If you have a full package with Cable that's £32 a month. It's probably more than that now - I think it's about £35 a month . . . mean if you then paid out for interactive TV on top - that's a lot money. We think you can then pay it like we do it - rental for a TV and video - I mean before you pay for interactive TV it's about £60." The man still agreed that cable would go in favour of i-Tv, for comparative scope of programming "Cable had the same and interactive had the same but with the same package but with a facility that you can use on interactive - the selection programme - you know being able to select what you want when you want - then Cable would go."

In terms of usability it presented no obvious problems apart for the issue of slowness. The woman alluded to an awareness of the problems of shared viewing experiences of interactive media. She felt it also strange to listen to the radio through her television, "It seems to be a waste of a screen really doesn't it?"

The man had shown friends the system, "we were showing our friends it yesterday and they think it's marvellous. Marvellous concept." He felt that the banking service would be useful. "because there is times we want to transfer money into our other accounts and we wouldn't have to go down to the bank to do it. Because we both have a joint account and Tracy has her own account and sometimes we switch money there to pay bills you see. I mean we wouldn't have to go down and that would be ideal." . However, they were not Nat West customers.

They both felt that i-Tv would be a desirable service, if only with a greater selection of programmes. The woman made reference to satellite and cable when they first arrived in the market, "You didn't know what that was going to involve." Apparently when Cambridge Cable first came out it was going to offer pay-per-view, but this had still not materialised.

CASE STUDY 5 - F010

Household 5 was a family home. The mother and father were present. There were two (male) children. They are a one set home. The man considered himself a TV addict, much more than his wife. They consciously try and "limit the amount of hours the TV is on. I am one of these people who come and turn the telly on and go off and do something and sort of snatch part of it but you tend to find with small children if you put the TV on they will sit in front of it and not do anything else so we tend to restrict in what they can watch other rather restricting ourselves what we watch within the actual hours." The mother was also vocal regarding the children's viewing "They are only allowed to watch an hour - an hour of TV at night time and that's it - nothing in the morning." The mother was very selective on what she allows to be viewed as well, viewing that cable tended to show more 'violence' than traditional broadcast channels.

The father felt that i-Tv would serve to economise on the subscription to the movie channel. He suggested that i-Tv has impacted on their TV viewing when they first

had it. They had explored it to find out what was on; "I was quite disappointed actually that once you had actually gone through it and watched everything . . .there were no new services come up - there is all these great ideas - I know it is only a trial but I don't feel a great deal has happened within the year or so."

They were not Nat West customers, and had "so many accounts and everything sort of it's too much hassle to change [banks] . . . with all direct debits it a lot of hassle to change on the direct debits." However, they remained interested in what Nat West had to offer through theirs. "You can pay your direct debit bills so that would have been something that we would have used because it is a lot easier than having to stand in a Post Office and queue." News was of limited use due to the restrictions of content. The husband added "There was talk of Tesco's doing their wine-list or something I believe and buying (couldn't make out) - I don't think that has happened yet has it?"

Advertising was seen as a way in which "they would have more revenue coming in and maybe they are looking to do more research into the Internet, I mean into the interactive TV. . . There is nothing wrong with advertising if you are watching a particular topic or whatever - I don't see any reason why you shouldn't have adverts on that relates to that topic. Probably be quite happy to watch that. But I wouldn't like to see normal sort of rubbish that you get on mainstream TV where it is cars and drinks and what have yous." Generally, they felt that advertising should not intrude, but should rather be kept to a separate advertising, commercial and retail section.

They were generally amenable to market research type surveys through the system: "I mean if somebody who had made (?) sort of food or washing powder or whatever was to do like you said want to know what your personal habits were and what sort of washing powder you wanted to buy for whatever reason and in return for doing it you perhaps got a coupon through the door or something - then yeah we would do that wouldn't we? . . . If the adverts are grouped together, certainly I know you will get fed up with new car adverts and that sort of stuff, but I you were thinking of buying a new car then it would be nice to think you could just punch something up on your... and you would get a selection of car adverts or something with information where you could write off you know to get more information" They would value having more factual information about a product.

Access to the Internet was recognised as severely limited by not having a keyboard. The Cambridge web site which is the one they access news through. Again a keyboard was cited as being of use to access the service further. The wife however had not used the web service at all, but nevertheless seen it as possession as desirable. They lacked the direct comparison of the web service against the performance of a PC; "It's very slow loading up - quite a lot of the things - I know there was a lot of the picture and stuff is does take a long time to come through. I don't know with the normal computer takes as long to load as it does on here or if it is the way it has been presented here it is taking longer."

The mother saw that the system was "not very children friendly. I mean Tom is used

to using a keyboard at school - he is used to using computer - so that's not like an alien to him." In respect to education the mother, felt that the programmes used for arithmetic and maths had obviously been bought from the US or Australia as the accents were not English. She felt this would confuse her children. Again they felt the choice available was limited (maths, English and science), they felt he should be able to do geography.

The father also suggested that the remote control was not very "user-friendly," this was agreed upon by the mother. The father saw that "The way the buttons were you have to be very precise to actually get a response from the TV in relation to it. It's not like an ordinary video or cable where you just sort of push it in - doesn't have to be directly pointed at the TV - it's very sensitive as to how it works or not." In operation they found that it was slow to start up. They also made mention of the way in which it kept shutting down "or suddenly switches off." They felt as if it was getting better.

They did not use the radio interactive service, mainly due to it not representing the stations that they listen to. Any radio listening was a "kitchen" or "upstairs" (bedroom?) based activity; "used for food making, tea on or washing up whatever you tend to be doing." or when "getting ready in the morning."

The box had also functioned as a talking point when they had guests: "You had friend round and you had friends round and they said what's that box there and she explained what they stick a code number in and people will come and sit here and play with it and go through all the things of course. So it has not just been exposed to us it has been exposed to friends, family you know, other neighbours have been in the habit of coming in playing with it so it has had quite an audience hasn't it." People's reaction to it had been "quite positive." This was put to the fact that they had "genuine" computers and were web literate. However it was felt that if they actually lived with the machine the reaction would be "similar" to their own (critical?).

This opened up a line of thinking regarding the diffusion of domestic media technologies via informal networks: "Well we were keen because when you hear this idea it is like - I can remember a video first coming out about sort of 1980 and you wanted someone that had got a video - you went round their house to see what they had. It was when we first had interactive games and that. We had the original space invaders - it was something really new and it was exciting - it didn't do a great deal but it was something different and it's the same thing here. You know you think this is novel technology now in 15 year's time we will look back and every home will have one and we were first to actually try it out. Well that's probably going to be the case probably in 15 year's time or whatever it will be everywhere but at the moment at the stage it's working at isn't enough to sustain interest."

They would not subscribe to i-Tv in its present state, although the wife thought it "inevitable" that it would be a part of the future. However, they felt that "Whether you would actually buy a set-top box or it would be in conjunction with someone like Cambridge Cable where it was provided as a separate service you could access that

way I am not sure."

CASE STUDY 6 - F011

The next household comprised of a mother and her daughter. The father and a 17 yrs old son were not present. They also take in boarders (students). There were multiple televisions. There was one in the living room, and four in various other rooms. The living room is the communal television. The mother hardly watches television at all, her daughter "sometimes." Viewing was dependent on "who is in and who is around." They very rarely watched it as a family. There is some disagreement over who watches and who does not between the daughter and son. This can be specific (i.e. he prefers sports and does not like the daughters preferences for soaps and chat shows) or unspecified (any video she has chosen).

They did not watch much satellite channels except for the daughter who watched MTV. The girl was very strategic with her viewing and accessed a guide, but at times when viewing non-directively she would "go from [channel] 1 downwards." The mother only viewed news and occasionally "old films, really old films." The mother was particularly scathing of much TV content. She never hired videos, but the daughter hired them "every few weeks." They had only acquired the video machine in the last few months and were "still getting used to it."

Neither the mother, nor daughter had much to comment on the use of the system, as the main user was the son who could not be present at the interview. However worth noting was that it was the son and daughter had advocated joining the trial. The mother had actively resisted, and there was some contention regarding the father's point of view (the mother saying that he was resistant as well, concerned about how much of the television the children would watch; the daughter saying he embraced the idea of having it for the "sports and stuff"). There was no evidence suggested that the father actually used the system.

The mother reticence was explained by her wider beliefs of the de-huminisation of social interactions through screen-based activities: "No it's not technology. It's something about the ability to lose human contact and if you really wanted to you could actually ultimately, I suppose, do everything in front of the screen and never talk to another human being. He [the son] started communicating with somebody on the computer at school and they arranged to do some swaps of things and work together or something like that and it was how shall I recognise you, you know, where shall we meet da, de, da, de, da and when it actually came to it they found that they had been actually sitting next to each other for the whole term and had never spoken to each other."

CASE STUDY 7 - F002

The next household consisted of was a one set home, with a video. They were cable subscribers. They rented on average one or two videos a week. They recorded programmes often. They preferred films, news and documentaries, but did not like

games shows. The woman saw that TV was used only "sometimes" in the morning or lunch time. The man saw that due to work commitments they often had to work in the evening and the television would be switched on around 9 p.m., for "an hour or so before going to bed." At weekends, they often invite neighbours in to a "sort of television session" where they will all watch a pre-recorded tape.

The main motivation for entering the trial was that "you would be able to choose to watch the programmes that you wanted to watch, when you wanted to watch them." I mean the thing that I was personally interested in was the Tesco supermarket shopping . providing that having ordered your purchases you can receive them reasonably quickly. I mean if you had to buy it today and then be around tomorrow at a certain time and say the delivery van turns up any time tomorrow morning that wouldn't be useful at all. The man added: "First thing is I don't like going shopping to supermarkets . . . The idea is that shopping is a pain and they should be able to make it easier and faster." He then stated that on the service you would need to have "to have pictures of everything," he wife retorted that she did not "know how they are going to organise that."

They had not explored every aspect of the system, education and the web were not explored.

The banking option was interesting but they did not have a Nat West account, however he remained open regarding opening an account if real benefit was obvious through the functionality and service; "I looked at it to see what you could do and the feature that seemed to be interesting to me was [that] you could automatically pay your bills rather than send a cheque or go to the bank or set up a standing order. . . If my bank was on I would use it . . [if] it was interesting enough to use it if I had it but not so much to go to the trouble of opening a NatWest account because you the longer you are in the bank then your credit record is OK. It is an awful fuss to change a bank account."

The man expressed that he did expect for CDs and music to be more available on-line "rather than it actually being just a selection of BBC radio recordings of programmes. We don't listen to the radio at home I only listen to it in the car. Well that's actually not true we do listen to the local stations at home quite often. We only listen to specific programmes."

They experienced little problems operating the system "once you got the hang of it." They had noted that the 'film' slows down occasionally and it is not a perfect picture. These were the only ones remarking on the quality of the MPEG encoding. They also remarked on the audio quality "I get the impression there is a loss of sound quality. I mean we have just got a hi-fi which we can actually connect to the video so you can connect to there on the interactive and you can play the hi-fi through that. We hadn't tried it out on the radio to see what we had got very good stereo so. An it feels a bit strange to see the television because when you switch on the radio you get a little picture of sky . . . A waste to have the television on just for the radio." Promoted to how interactive impacted TV viewing the man replied "I used to come out of garden

and it's nearly time for the news and you are kind of bound by the clock but now I don't bother I just come home and switch on and you have . . . The interactive thing and I can watch it when I want to . . . it has given me more control over my television."

The functionality of being able to fast forward and reveres was consider useful: "the video facilities that is reverse and pause - that is good." They also referred to the news updating. Apparently it was updated every week day, but not at the weekends. The last recordings were on Thursday, "so on Sunday you still get Thursday's programmes." It was also noted that the programmes were BBC orientated while it used to be ITV. This was important because the man "It used to be but I personally like watching ITN. It depends some ITN news programmes are better than BBC1 so I watch News at Ten as opposed to the 6 o'clock news. I watch the news at 5.40 on ITN. I think that is better than BBC. I think at the moment it is just BBC that it on here."

Regardless of his reservations the man still thought that i-Tv was part of the future. "Yes, I would pay money to have one if I could watch all the programmes that I watch when I want to. We don't at the moment pay for satellite television." They had taken on cable as part of the trial, but did not subscribe to movies; "I mean those are the ones that are worth paying for but we haven't bothered paying for them because rather than watch films on cable television we would rather pay to get a video out. So the only reason for getting Sky Movies is because you get the latest releases but they are available on video so why pay 20 pounds a month to see 50 films of which you might want to watch three and you could pay whatever it is, 6 pounds to get all three from the video club."

The main advantage was "Apart from watching programmes when you want to I think high street shopping, banking and all the sort of things that are very difficult to do outside normal working hours."

CASE STUDY 8 - F025

This household comprised of a couple - no children, the wife was absent from the first part of the interview. They were a 2 television household. With the main living room set providing the cable service which was provided as part of the trial. They never rented pre-recorded videos. The wife was an "addict" of the news. The man preferred comedies, and also liked films, which his wife did not like. He had been watching these on cable. They also like nature programmes. He saw that "In the summer months you get more or less distracted from television." He remarked how they had been connected to the Internet: "I am not able to make full use of it I am afraid but it's... lucky to be able to get that I suppose. But there again I think we are privileged in being able to be the first people in the world to be able to get it through our television as opposed to a modem."

In respect to his anticipation of what i-Tv would be like he was unsure: "I didn't even know the meaning of the word interactive. People kept spouting this out and I seemed to be asking what does the interactive mean. But I know now - it's something

which you can react on." He had glanced superficially at services such as education, and being a Nat West customer he found the banking service of some interest and use: "I couldn't see how you get cash out of the bank through the cable but apart from that I can see it did function quite well. Quite often, almost every day I used to tune in to see what my balance of account was . . . It was bang up to date. You get it right up to the previous day and I shall miss that really. Because getting your statement of account only twice a month - it's a bit outdated. I have been looking forward to getting home shopping. But that hasn't been forthcoming. I am wondering now whether it ever will be." He deduced that the withdrawal of the service was an indication that home banking was becoming defunct: "As home banking is becoming defunct - that hasn't proved successful."

With respect to the radio he expressed some interest but was discerning regarding the availability and sound quality of the radio via the television: "I rather tended to think there were a bit superficial. You see you don't get the quality of reception that you get on the hi-fi and I tuned in to the radio programme, the music programmes, particularly the middle of the road music, not classical, not pop.

He felt that it was easy to use, "once you get a hang of it." He was intrigued the Internet: "It's, as I say, that has revived an interest in the thing as a whole and I should like to be able to use it to the full advantage which I hope possibly only to after attending the open evening in September.

He felt that i-Tv would be part of the future; "Yes I do. When we went to the open evening last autumn I think it was, they showed the system they would use if, for instance, you want to book up to see a play at the theatre. They have got a plan of the seats and you were able to choose the seats you wanted and sent it through the line and you would be able to pick up your tickets. I don't know how you would pay for them. Presumably you only got them. But that sort of thing seemed very useful to me and it hasn't come on-line yet but I think it has a future. Certainly has a future."

CASE STUDY 9 - F040

Household Tape 9 was a family home. The interviewees were a father and daughter. They were a multiple set family - a television in the parent's bedroom, one in the children's room, one in the kitchen and one in the lounge, which was the main the set and the one which was connected to the STB. There were two videos one in the parents room and one in the living room. They were used mainly for pre-recorded videos, and were used to record very rarely. They perhaps recorded material two or three videos every two or three weeks. This was mainly by setting the timer. It was reckoned that the STB should be connected to the kids TV as their set was watched more than the parents. They indicated that they had the movie channel, but apart from that they still watched "BBC1, BBC2, ITV and Channel 4 and rarely do we watch Sky, Sky 1."

The children mostly watched the cartoon channel. The father was doing an Open University course so he did not "get a lot of chance to watch TV. He was also a

councillor and was interested in various levels of political activities: "Yeah I am very interested in international politics and then national and then local."

The household had been featured on the cover of the Acorn User Magazine and interviewed. They had a computer at home and it had a modem. They had a connection to the Internet. Questioned on how he found it to use he reiterated that he barely used it: "I have barely used it because you can't get a lot out of it anyway from the access that they give you." He felt that an average person would not be interested in what the web had to offer: "you get bored after about 10 minutes, you know, bringing it up and reading the television screen . . . the average person isn't going to be interested scanning through lots of pages of crap basically - that's what it is you know. I want to see something moving in front of me and something happening. That kind of thing."

He was not attracted at all by shopping on-line: "I think if I - all right take me for instance - I don't shop anyway. My wife does all the shopping - very rarely do I go down the shop . . . she goes shopping for clothes. I would doubt - she's had catalogues here which is basically the same sort of thing isn't it - I would doubt very, very much that she would throw away actually going down into town to have a look and try the gowns and whatever it is for like looking at it on a screen or whatever."

He saw that having programme-on-demand would have a major influence on the way in which they watched television: "I would say it would have a big influence on us if that was the case. Well then we would choose movies from them. We would choose movies and soaps and documentaries and educational stuff from them then . . .I mean I am doing, as I say, an Open University degree and they have got some small bits of Open University on it and that would be nice if I could call up bits from the Open University to watch - that would be absolutely marvellous you know. To sit down and have a catalogue of what you can actually see." The man was very attracted to being able to access new archives, his wife was less excited by the proposition, but was enticed when it was suggested that she could "dial a topic I suppose," such as gardening.

He felt that interactive adverts would be " . . . fashionable. It will be very fashionable. I would expect on-line to, when they market, when they sort of market their programmes, or when they sell their programmes, the advertising would come with it and it would be up to the advertisers to make their part of it interesting. His wife said she thought it was to be paid for by subscription, she was surprised that there would be adverts on top of that. The father felt that he would expect adverts above and beyond subscription; "you would have situations where there would be certain programmes where they would have to make a charge, depends on how good they are. You know there might be some really good plays for instance that had been on, that kind of thing."

The father had some views on on-line questionnaires "If I was watching it, I like the idea, I think you have got to, people don't like to hang about too much do they, they will sit and watch something and then sort of go away from it. It might be an idea to

have maybe one or two questions, not go into any great detail, but I mean you people are supposed to know how to work all this and that.

The man had a Nat West account but felt that: "Not really I don't think it really interacts with television properly. The service which is, I found, most useful to me was being in the home banking but I heard today that they were discontinuing that."

Asked what triggers him to use the systems he replied that "Just sense of duty I think to earn my cable television."

CASE STUDY 10 - F071

Household was a family household, a mother and father, a young daughter. The mother had taken up media studies the year before. The interviewee is a mother. Television viewing is usually in the evenings, however she watches news at lunchtimes. They have a video which is broken at the moment. They have not been encouraged to fix it due to receiving the movies option as part of the trial: "we have no need to get the videos out but yes we would do really which is why I would be really keen for the video on demand to actually be up and working because I think I would definitely use that." The main channel viewed was SKY1. The woman prefers American dramas, while the father prefers action films. She reckoned that they watch a couple of films a week.

Television was used for relaxation and "to keep the kids quiet." One of the major pitfalls however was that "the good programmes tend to be on at a time when I can't watch them . . . I really don't sit down till about 9 o'clock. Some of the situation comedies are on like half seven, eight o'clock which I probably enjoy more. I think they should definitely go ahead and move the 10 o'clock News." She said that she did not "get a chance to sit down and read," and preferred to sit and watch the news. Her partner related that she gets tired if she sits down with a book.

Her original motivation to participate in the trial was to get the free movie channel, however they were also interested in finding out more about it "as well." Her participation in a media studies course also prompted her interest. One of her essays had been on new technologies and TVs. Her anticipations of the system compared to using was that they expected to do more with it, "That's what we were led to believe anyway . . . I was expecting a video. "If the home banking was up and running I would definitely use that." She banked with Barclays. Nevertheless, since she ran a business from home "it would be a good thing to have that (banking services) through the television . . . I'm a fitness instructor so I mean it's not a vast amount of money I'm dealing with but it's enough to bank once a week and check-up on - check balances and things."

She felt that shopping would be an asset to her lifestyle: "I mean I have spoken to friends about it and think a lot of people's initial reaction is 'I really enjoy going round the shops and looking at it all but for the once a week chore shopping, you know the things that you have to get every week, to take that out of it - yes.'"

In respect to education she felt that response and speed was important: "I've got a PC upstairs that's far quicker - yet when it gets on to that level when you really have got the combination of the computer and a television together then that would be good but at the moment the kids will have their files of the stories that they have got on there but once you have done it a couple of times.

They had been intrigued when the system went on-line, "looked at everything." They had only accessed the local news in the first sessions, as well as fishing programmes "it's like watching paint dry isn't it?" The radio was only used once as well. In respect to usability of the system "No it was really user friendly. The length of time perhaps that you have to wait being used to computers that are a lot quicker." She thought that it took as long as teletext to access as page.

They had not "really used" the interactive system. "I can see the potential but as it stands at the moment, the trial, we've probably used as much as we are ever going to use it because it hasn't really changed that much. The refresh of programming and content was a major issue to whether they thought the novelty of the system would wear off "I mean on how often they change the games on there. I mean obviously if they kept the same games - yes they would get fed up with it but I mean if they changed them.

CASE STUDY 11 - F028

The final household was NOP11. This was a couple. The husband watched mainly sports and news. He was also into drama. They were a 2 set home, the main set in the living room and another in the bedroom. There was no change in their viewing preferences, bar that of accessing more movies with the option that came with the i-Tv system. They would not have taken it independently as it was too much money. They watch SKY Movies "perhaps twice a week."

They tended to watch late at night "mostly what we watch on the Movie Channel is late night anyway, after 10 o'clock. The man had "quite a collection" of videos which he was keeping: "Most of those were westerns actually which I collected for my own, you know. He did not watch a lot of i-Tv "because I watched the programmes I was interested in and that is, to be quite blunt with you, I am not very happy with it over that . . .There are 6 fishing programmes on there - *John Wilson, Go Fishing* and the same programmes have been on . . . You can't keep watching things over and over and over again."

The main motivation for joining the trial was that "they sent letters round asking they wanted people in certain areas if they would do it and well they wanted people who have got children or grandchildren etc., so that's why we did it. We thought it would be something to try you know." His wife said it "sounded interesting . . .it said that if you want to watch a certain film which had been on and you had missed it you could go back and watch it - no . . . Yesterday's news is on but for Godsake who wants to watch yesterday's news when you have seen it. Radio programmes - if I wanted to listen to radio programmes I should listen to it when it was on. I mean that's how I

look at it." In respect to the banking he had never successfully accessed that due to not receiving a pin number. And the children's programmes "I think they are little bit - one or two of those are a little bit complicated for the children because you couldn't leave them to watch it."

The man stated he found it awkward to work, but when promoted by the interviewer whether it was easy or awkward he replied: "No it's not too bad. It's quite simple really. Just to watch basic programmes, change from one programme to another it's quite easy." He now only accessed the system to see if they had changed the fishing programmes. In his opinion they should refresh programmes "at least once a week . . . . Because it gives everybody then a chance to see those who wouldn't have the same leisure time you know. I think it's a good thing for education. I think if it got into schools for education of the school that sort of thing. Basically at the moment, a person like myself, it's not use to me really whatsoever unless they are going to change the programmes."

The idea of on-line catalogue-style shopping was not of interest to the man, he also viewed that the weekly supermarket shop would be of use to his wife: "she definitely wouldn't buy weekly stuff out of it." I mean you get QVC on that, you know, but I occasionally watch that you know if there is nothing else on or if I see something on that catches my eye but I wouldn't ever buy anything from it. He felt that were not enough coverage on local matters.: "there is a lot goes on in Cambridge that people even in Cambridge don't know about. There is a lot goes on in your locality that people in your locality don't know about. I mean I know this for facts in my country and western dances at the Arbury Community Centre there are people living 100 yards away didn't know they were on . . .Everybody likes learning about their own locality better than they do anything else so you know. What's going on in the next-door-neighbours is much more interesting than what's going on in Arabia or somewhere like that I can assure. It's true - it is true that." He felt that an archive-style news facility would be of use especially for children "I think that could be OK because I mean if anybody was, specially for children, that would be a very good thing for kids at schools."

On the subject of advertising he felt that there would be a union of both subscription and advertisements which paid for the service. He was attracted by targeted adverts, but not without reservation: "the problem is the car and if you went off fishing you would be getting the same old stuff all the while wouldn't you. No I think you would have to have what they throw at you."

He felt that the system had a future; "I don't think it will be a damp squib . . . They have got to alter it a little bit but quite a lot of it actually. There is some of it, I think I can definitely see it being part of the future, definitely."

He was in favour of on-line questionnaires: "Oh yeah that would be easy. Good idea actually - I think they would get more feedback that way than any way. It would be instant wouldn't it. You would get one or two that would. The odd ladies who have got nothing else to do but, you know bored with housework . . . having a quiz survey

about what you like about this breakfast food etc. and what you... I don't think people would do them unless it's a bored housewife who has got nothing else to do." However when promoted what kind of reward he would consider reasonable for filling in a 5 minute questionnaire he replied that he would not probably do it at all.

Appendix 2. Two Trials

In the sparse literature on the subject of i-Tv, two trials that are widely cited are the Warner-Amex *QUBE* trial conducted in the late 1970s and early 1980s; and the Time –Warner *Full Service Network* (*FSN*) trial conducted over the period 1993-1997.[146] (i.e. DeFleur and Ball-Rokeach, 1989; Neuman, 1991; and Carey, 1994) Both came to show failure in pre-empting a variety of factors, human, ergonomic, content, as well as technology issues. However at their onset there was a distinct belief, shown by the faith in the significant investment each drew. It was held that they were indeed a proper representation of the technical capabilities and trends of the time, technologies and services which would appeal to latent consumer demand, and that each were represented a route to creating viable commercial propositions.

QUBE

The Warner Communications and Amex Cable *QUBE* system was launched in Columbus, Ohio, 1st December, 1977. The QUBE system offered subscribers pay-per-view movies, and being able to take part in on-line polls and feedback. However, QUBE as a commercial proposition failed. No more than 20 per cent of subscribers used the interactive programmes, and the trial folded with reported loses of $30 million (DeFleur and Ball-Rokeach, 1989). It was found that those users who did interact, would only do so for a few weeks and then return to more (traditional) passive modes of viewing. One of the reasons which has been cited for this was that:

> "The behavior of the average television viewer is largely culturally enforced. It should not be surprising if most households react hesitantly to two-way television. The preceding 40 years of experience have engendered a different set of expectations." (Neuman: p.113)

In other words, the suggestion is that the QUBE trialists found it difficult to react due to their socialisation into using passive forms and formats of media. It was suggested that QUBE was so expensive that Warner kept the true cost secret even within its executive ranks. Carey (1994) cites the QUBE terminal in homes costing approximately $200, or four times the cost of standard cable decoders at that time. QUBE equipment at the cable head end added approximately $2 to $3 million in plant costs:

> "In addition, it was both expensive and difficult to maintain the upstream or return data path from homes, which introduced reliability problems for the interactive service. Production costs and interactive program design presented

[146] The FSN trial ran almost concurrently with the Cambridge i-Tv Trial outlined in this thesis

> further obstacles. Compared to broadcast network programming, budgets for QUBE programs were very low. "Interactivity" with low production values could not compete with network programming. Moreover, because they had little previous experience in designing interactive programs, QUBE producers were starting from scratch." (Carey, ibid)

Carey is suggesting that the economics of interactivity made for a lower quality of experience compared with traditional broadcasting programming. Also of significant note was that Warner-Amex did not know how interactive television would work, and hired an executive to "dream up a variety of new applications." (Neuman, 1991: p.111) Neuman also notes that interactive programming did not generate enough revenue to support its locally produced two-way information. Nevertheless it did perform as a marketing tool distinguishing its service from other cable operators bidding at the time for big-city franchises. Also, QUBE whetted the interest of American Express Co., which bought 50 percent of the Warner cable business in 1979. American Express was eager to tap the potential of electronic commerce, like banking and shopping, from the home. Warner- Amex halted QUBE in 1984 in large part because of the losses its parent company, Warner Communications, incurred with its Atari subsidiary, when video game sales fell well below forecasts.

Carey cites that QUBE demonstrated that, if the cost of promoting and processing pay-per-view orders were reduced, then pay-per-view programming was potentially viable. It also introduced a number of interactive formats that have since evolved and been adopted as components in cable and broadcast programming. Its interactive programming included American football games play-offs; on-line polling; shopping and interactive video games. In fact, both MTV and Nickelodeon trace their roots to QUBE's experiments.

> " . . . interactive media must be developed in a viable economic and technical context. Even with these elements in place, producers must learn to create with the new medium, and audiences should not be expected to change their media habits overnight." (Carey, ibid.)

QUBE was followed in the early 1980s by two high-profile videotext projects, Viewtron from Knight-Ridder and Gateway from Times-Mirror Co. Although all three are generally referred to as "failures," each led to high-profile services that are now extant in traditional and new media. And they were the precursors of the on-line services Prodigy, CompuServe and America Online, which in turn preceded the Internet boom.

Also, the emergence of the eighties video game playing generation attitudes and behavioural responses to interactivity may be quite different. The video games playing generation are the first people *en mass* to interact with information held within the rectangular domain of the screen. It may be assumed that they differ from their older counterparts in that they have been already socialised into interaction.

Full Service Network

In a giant ballroom of the Sheraton Orlando North Hotel on December 14, 1994, Warner (this time as Time-Warner) launched a further attempt at creating interactive television - the *Full Service Network*. Its stated objectives were to fine tune the technology for a high-speed digital system; to learn about consumer preferences; and to provide a platform for consumer development and for testing products. The FSN was to exploit recent developments in digital technology to offer a range of services 'on-demand' including the delivery of video. The trial was originally aimed at lasting 18 months, and its target populations were 4,000 subscribers (1994); 500,000 subscribers (by 1996); 750,000 subscribers (by 1998). It ended with the firm claiming success but being, as they were about QUBE, extremely conservative in publishing their findings.[147] Total cost of the trial to the company is estimated by some at up to $100m (which overshadows Acorn Online Media's start-up costs of £1.84m and Acorn's cited intention to invest £13m in the trial over the period 1994 to 1997).

Six months later, in June 1995 the FSN was in fewer than 36 homes. Time-Warner then took it upon themselves to accelerate installation towards the end of 1995. They did this by implementing large installation crews and dozens of marketing representatives and FSN executives pitching in as customer "trainers" before the company announced the completion of 4,000 installations.

It came to be found however, that customers' willingness to pay for on-demand movies was way below a level that would make the construction of a broadband network anything like a sound business proposition.[148] It existed within a market dominated by a range of films available on the existing cable and satellite channels. There was also the imminent promise of even more channels to come with digital TV. There was also the cheap and easy availability of video rental. In addition the FSN needed to equip subscribers' homes with a $5000 Silicon Graphics computer as a STB – which had to given away free to subscribers along with other peripheral devices. The trial ended in 1997 with wide suggestion that the key problem with digital interactive services such as video-on-demand was that like its analogue predecessor, it lacked economical viability.

147 Information regarding the performance of QUBE only 'leaked' out when former employees informed on the trial's success (Neuman, 1991).
148 ACTS BULLETIN

Appendix 3. Sys-logging

The Cambridge iTV Trial
NOP Research Group Ltd

THE SYSLOG FILE

By setting up a log file it is possible to monitor how a service is being used. All user activities are recorded in the log file. Using this information combined with our demographic data we can currently monitor:

- How users navigate the services on offer (frequently used routes, unused services etc).
- What time a service is selected.
- How long a service is being used for.
- Total time spent using the system.
- User demographics by household. *Individual demographic data is not currently possible, this is a matter for Online Media.*

The Syslog file is not fixed-width, fields are white-space delimited.

SYSLOG FILE FORMAT

Field	Description	Start	End
1	Month	1	3
2	Day	5	6
3	Time "hh:mm:ss"	8	15
4	*Server Identification.*	17	22
5	*Server rpc message.*	24	26
6	*Server event message*	28	32
7	User Identification.	35	35
8	*Server process identification.*	37	45
9	Service Provider Identification assigned on request (see Service Provider Breakdown).	47	49
10	Service Identification defined by service provider.	50	52
11	Event Message defined by service provider.	53	58
12	Record Tag (see Record Tag Breakdown).	60	69
13	Detail	71	-

EXAMPLE SYSLOG FILE

```
          1         2         3         4         5         6         7         8         9         10        11        12
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678
Aug 14 11:20:15 me_b15 rpc Event: 0 :[20629]: NONNON000000      START <Trial$Dir>
Aug 14 11:20:19 me_b15 rpc Event: 0 :[20629]: NAVLOGEntPin       EXEC TrialApps:CApps.Logon 1000 120
Aug 14 11:26:58 me_b15 rpc Event: 0 :[20629]: NAVLOGEntPin     RESUME NFS::nfsboot.$.Cm.JPEGs.1.0
Aug 14 11:26:59 me_b15 rpc Event: 0 :[20629]: NAVLOGEntPin       GOTO Message
Aug 14 11:27:02 me_b15 rpc Event: 0 :[20629]: NAVLOGMessag       EXEC TrialApps:CApps.Message 200 700
Aug 14 11:27:05 me_b15 rpc Event: 0 :[20629]: NAVLOGMessag     RESUME NFS::nfsboot.$.Cm.JPEGs.Message.1.0
Aug 14 11:27:06 me_b15 rpc Event: 0 :[20629]: NAVLOGMessag       GOTO ^.Home
Aug 14 11:27:17 me_b15 rpc Event: 0 :[20629]: NAVGMI000000     BRANCH leisure
Aug 14 11:27:24 me_b15 rpc Event: 0 :[20629]: NAVGMI000001       BACK 1
Aug 14 11:27:30 me_b15 rpc Event: 0 :[20629]: NAVGMI000000     BRANCH TVRadio
Aug 14 11:27:38 me_b15 rpc Event: 0 :[20629]: NAVGMI000002     BRANCH News
Aug 14 11:27:40 me_b15 rpc Event: 0 :[20629]: NAVGMI000002   UNAVAIL NFS::nfsboot.$.Cm.JPEGs.Home.TVRadio.News.1
Aug 14 11:37:31 me_b15 rpc Event: 0 :[20629]: NAVGMI000002   UNAVAIL NFS::nfsboot.$.Cm.JPEGs.Home.TVRadio.1
Aug 14 11:38:12 me_b15 rpc Event: 0 :[20629]: NAVGMI000002       BACK 1
Aug 14 11:38:31 me_b15 rpc Event: 0 :[20629]: NAVGMI000003     BRANCH TVRadio
Aug 14 11:38:35 me_b15 rpc Event: 0 :[20629]: NAVGMI000002     BRANCH BBC:JPEGs.1
Aug 14 11:38:37 me_b15 rpc Event: 0 :[20629]: NAVGMI000002   UNAVAIL BBC:JPEGs.1
```

http://www.uk.infowin.org/ACTS/ANALYSYS/GENERAL/ACTSBULL/may-97.htm#time.

Breakdown of Syslog Codes

Service Provider Breakdown

ID	Description
NWB	National Westminster Bank.
BMP	BMP DDB Needham.
TES	Tesco Superstores.
ACN	Acorn Computers.
OMI	Online Media.
NAV	Navigational Screens.
ANG	Anglia Television.
NOP	National Opinion Polls.
BBC	BBC
POS	Post Office.
QQQ	*Reserved for user feedback, following data contains the questionnaire ID, the question ID and the answer ID.*

Record Tag Breakdown

Tag	Description of Event
APPMSG	A subprogram has returned a message to be displayed to the user.
AVAILABLE	The service has resumed after unavailability.
BACK	User navigated back one or more levels of a the tree.
BRANCH	User has branched to another node in the tree.
ERROR	A fatal system error has occurred.
EXEC	Launches a subprogram.
GOTO	User has branched to another node in the tree (as BRANCH).
HOME	User has returned to Home page.
LOG	Log Hot-Spot or a log command.
QUIT	User has quitted Navigator using the quit command.
RESUME	Navigator has restarted afar executing a subprogram (see EXEC, RUN).
RETURN	Subprogram executed with RUN has terminated.
RUN	Launches a subprogram.
START	Navigator started.
UNAVAIL	Selected page (or whole tree) is unavailable